JUN 25 1947

MEDICAL LIBRARY

VOLUME 45 NUMBER 5

ARCHIVES OF

OTOLARYNGOLOGY

EDITORIAL BOARD

GEORGE M. COATES, Chief Editor
1721 Pine Street, Philadelphia 3

WESTLEY M. HUNT, New York
RALPH A. FENTON, Portland, Ore.
ERNEST M. SEYDELL, Wichita, Kan.
CHEVALIER JACKSON, Philadelphia
ROBERT L. GOODALE, Boston
J. MACKENZIE BROWN, Los Angeles
CARL H. McCASKEY, Indianapolis

MAY 1947

PUBLISHED MONTHLY BY AMERICAN MEDICAL ASSOCIATION, 535 NORTH DEARBORN STREET, CHICAGO 10, ILLINOIS. ANNUAL SUBSCRIPTION, $6.00

Entered as Second Class Matter Jan. 14, 1925, at the Postoffice at Chicago, Under the Act of Congress of March 3, 1879

COPYRIGHT, 1947, BY THE AMERICAN MEDICAL ASSOCIATION

CONTENTS OF PREVIOUS NUMBER

APRIL 1947. NUMBER 4

Pedicled Pericranial Grafts for the Repair of Dural Tears in the Anterior Fossa of the Skull. Arthur D. Ecker, M.D., Syracuse, N. Y.

Otolaryngologic Experiences in the Philippines. Stanton A. Friedberg M.D., Chicago.

Pentothal Sodium and a Combination of Pentothal Sodium and Curare as an Anesthetic for Tonsillectomy. Robert B. Robertson, M.D., Ancon, Canal Zone.

Interrelationship of Hydrogen Ion Concentration, Electrolyte Contents and Colloids in Permeability of Membranes: Calcium Sulfathiazole in Nasal Therapy. Simon L. Ruskin, M.D., New York.

Pressure Treatment of Allergic Sinusitis. J. Mathews Robison, M.D., Houston, Texas.

Friedlaender's Bacillus Meningitis Secondary to Otitis Media: A Report of a Case with Recovery and a Review of the Literature. Alexander D. Ghiselin, M.D., New York, and Lieutenant Robert B. Robertson, Medical Corps, Army of the United States.

Classic and Other Types of Tracheotomy. Richard Waldapfel, M.D., Grand Junction, Colo.

Case Reports:

Tertiary Syphilis of Ear, Nose and Throat. Lieutenant Abraham I. Goldner (MC), U.S. N.R.

Rhinoscleroma in Brazil, with a Report of a Case. Pedro C. Falcão, M.D., Ribeirão Preto, Brazil.

Salivary Gland Tumor of the Middle Ear and Paget's Disease (Osteitis Deformans) of the Skull. Frank J. Novak III, M.D., San Francisco.

Progress in Otolaryngology. Summaries of the Bibliographic Material Available in the Field of Otolaryngology:

Tumors of the Nose and Throat. Gordon B. New, M.D., and Edward L. Foss, M.D., Rochester, Minn.

Abstracts from Current Literature.

News and Comment.

Book Reviews.

Directory of Otolaryngologic Societies.

ARCHIVES OF OTOLARYNGOLOGY

VOLUME 45 MAY 1947 NUMBER 5

COPYRIGHT, 1947, BY THE AMERICAN MEDICAL ASSOCIATION

STREPTOMYCIN IN SURGICAL INFECTIONS

III. Otitis Externa, Otitis Media, Mastoiditis, Brain Abscess and Meningitis

MAJOR EDWIN J. PULASKI
AND
FIRST LIEUTENANT CHARLES S. MATTHEWS
MEDICAL CORPS, ARMY OF THE UNITED STATES

EXPERIENCES with streptomycin therapy of infections in United States Army hospitals have been reported from time to time.[1] The purpose of this communication is to present the results of streptomycin therapy in a group of 37 patients with otitis externa, otitis media, mastoiditis, brain abscess and meningitis. All the patients were treated in United States Army hospitals, the majority at Halloran General Hospital.

The prognosis of infection of the ear and adjacent structures has improved markedly since the advent of the sulfonamide compounds and penicillin. However, the management of these entities per se, especially when they are in combination one with the other, still presents a challenge to the physician. Many of the causal organisms are refractory to penicillin and to the sulfonamide compounds, either because of natural resistance or because of acquired fastness resulting from inadequacy of contact with lethal concentrations of the drug or from inadequacy of dosages or from both. Penicillin is the drug of choice in the treatment of these conditions when they are caused by susceptible bacteria, because of its greater potency and lesser toxicity. Its efficacy, however, is impaired in the presence of the mixed infections common to auditory canals. In chronic otitis externa and media the sulfonamide drugs are of limited value, since their bacteriostatic action is inhibited by pus and necrotic tissue elements. On the other hand, sulfadiazine is highly efficacious in the treatment of certain types of meningitis. In contradistinction to penicillin, it readily passes the meningeal barrier in thera-

This project was carried out as a part of the study being made under the direction of the Army Medical Research and Development Board, Office of The Surgeon General.

1. (*a*) DeBakey, M. E., and Pulaski, E. J.: An Analysis of the Experience with Streptomycin in U. S. Army Hospitals, Surgery **20**:749 (Dec.) 1946. (*b*) Pulaski, E. J., and Sprinz, H.: Streptomycin in Surgical Infections: I. Laboratory Studies, Ann. Surg. **125**:194 (Feb.) 1947. (*c*) Pulaski, E. J.: Streptomycin in Surgical Infections: II. Infections of the Genito-Urinary Tract, ibid. **124**:392 (Aug.) 1946.

peutically adequate levels. This risk of toxicity attending the use of the sulfonamide compounds leaves much to be desired of these agents as chemotherapeutic aids.

Streptomycin, now becoming generally available, has a lower toxicity than the sulfonamide drugs. It is not inhibited by the products of proteolysis. Unfortunately, it may not be administered orally in the treatment of systemic infections, because it is not absorbed from the gastrointestinal tract. However, as in the case of penicillin, after parenteral administration it rapidly diffuses into the body fluids in bacteriostatic quantities. It penetrates the meninges to a limited degree, and for meningitis it must be injected directly into the cerebrospinal system. Streptomycin acts potently against the majority of gram-negative, and many gram-positive, organisms. However, organisms vary greatly in their susceptibility, and streptomycin fastness develops relatively soon and is permanent. Therefore the clinic must work in close conjunction with the laboratory so that the appropriate drug may be given in proper dosages without delay.

PREPARATION OF THE DRUG

Streptomycin is available in a crystalline form as a sulfate or a hydrochloride. It is readily soluble in aqueous mediums and is stable. For systemic administration 1 Gm. of streptomycin is dissolved in 10 cc. of sterile isotonic solution of sodium chloride. This solution is stable and may be kept in the refrigerator without loss of potency. From 0.25 to 0.5 Gm. is given intramuscularly every three or four hours day and night, together with 1 cc. of a 1 per cent solution of procaine hydrochloride, which we have found alleviates the local discomfort which ordinarily follows injection. For intrathecal injection 5 to 10 cc. of isotonic solution of sodium chloride or cerebrospinal fluid is used to dissolve 0.1 to 0.5 Gm. of the drug. Usually this dose is given once daily. For topical application streptomycin is dissolved in saline solution so that each cubic centimeter contains 5 to 10 mg. (5,000 to 10,000 units). Occasionally the drug is suspended in "Carbowax 1500" ointment base [2] or is mixed with sterile dry human plasma. When the latter is used, 0.25 Gm. of streptomycin is aseptically triturated with each gram of sterile plasma powder.

THERAPY OF CHRONIC OTITIS EXTERNA

Five patients with chronic otitis externa (table 1) had streptomycin topically applied either by means of saturated wicks or by a postural flooding of the auditory canal. All organisms recovered from the discharge were isolated in pure cultures and found sensitive to streptomycin. The infections had been present from three and a half to thirty-six months. A variety of antiseptics and chemotherapeutic agents had been tried and found ineffective. Streptomycin was used in conjunction with routine treatment. The canal was swabbed dry, debris was removed and saline, boric acid or hydrogen peroxide irrigations were given as indicated. The clean, dry infected surface was then flooded with a

2. The carbowax compounds are polyethylene glycols of high molecular weight.

solution of streptomycin (5,000 units [3] per cubic centimeter), which was retained in situ either by posture or by packing. The treatment was renewed once or twice daily—oftener when the exudate was copious. All patients showed rapid improvement with complete disappearance of the drainage in three to eight days. Epithelization quickly ensued. There were no relapses. No local or systemic toxic phenomena were encountered.

Conclusion: In 5 cases streptomycin topically applied cured chronic otitis externa due to susceptible organisms refractory to therapy with other agents. Its apparent effectiveness against infections due to organisms that have been proved susceptible warrants more extensive trial and confirmation.

TABLE 1.—*Otitis Externa*

Case	Organism *	Duration, Mo.	Dosage †	Result
1	Hemolytic streptococcus	36	Saturated wicks three times daily for 5 days	Rapid improvement
2	Ps. aeruginosa	7	Total: 23,000 units for 3 days	Dramatic improvement
3	Ps. aeruginosa	3½	Total: 40,000 units for 8 days	Prompt improvement
4	Staph. aureus, Proteus ammoniae	?	Saturated wicks three times daily for 7 days	Prompt improvement
5	Staph. aureus, hem.	?	Saturated wicks two times daily for 7 days	Marked improvement

* Fungi were not noted in the cultures.
† The streptomycin was in sterile isotonic solution of sodium chloride (5 mg. per cubic centimeter).

CHRONIC OTITIS MEDIA

There are 11 patients in this group (table 2); 10 were young men, while the remaining patient was a 7 year old child. Unfortunately, some of the causative organisms were not subjected to the susceptibility tests. However, the organisms tested were sensitive to streptomycin. All patients were treated by topical instillation as in the cases of otitis externa. Routine measures of cleansing the cavity by syringing were employed before streptomycin solution was introduced. The clean and swabbed-out canal was usually flooded with the antibiotic solution (5,000 units of streptomycin per cubic centimeter), and the process was repeated one to three times daily. Occasionally the solution was instilled into the tympanum through the perforation. Four of the patients had serious infection pursuant to mastoidectomy (cases 1, 2, 3 and 4). In each instance the topical administration of streptomycin was followed by change in the quantity and the character of the discharge, from copious purulent to minimal serous. Concurrently, healthy granulation

3. One unit equals 1 microgram.

tissue appeared. When this change was effected, streptomycin therapy was discontinued. Of the remaining 7 patients, improvement occurred in 6, while in 1 (case 7) no benefit resulted. This failure is unexplained, since the organisms were found to be susceptible in vitro. In the 6 patients the suppuration ceased in 4, leaving a dry perforation, while in 2 (cases 5 and 6) a minimal discharge persisted. In these 2 cases subsequent application of 2 per cent acetic acid, which had previously been ineffective, proved efficacious. The 7 year old child (case 9) had chronic otitis media with purulent discharge of the right ear following

TABLE 2.—*Otitis Media*

Case	Organisms	Days Treated *	Type	Result
1	Staph. aureus, Ps. aeruginosa	10	Postmastoidectomy	Discharge diminished almost completely; condition clinically improved
2	P. vulgaris, Ps. aeruginosa, Friedländer's bacillus (K. pneumoniae)	7	Postmastoidectomy	Minimal persistent discharge
3	Staph. aureus, Diphtheroid bacilli	10	Postmastoidectomy	Disease clinically arrested
4	Staph. aureus, P. vulgaris, Str. viridans Ps. aeruginosa	3	Postmastoidectomy	Condition improved
5	Staph. aureus, P. vulgaris	10	Chronic	Minimal discharge, alleviated by 2% acetic acid applications
6	Staph. aureus, Ps. aeruginosa, Diphtheroid bacilli	7	Chronic	Minimal discharge, alleviated by 2% acetic acid applications
7	Ps. aeruginosa	5	Chronic	No improvement
8	Staph. aureus, Hemolytic streptococcus	4	Chronic	Clinical arrest
9	Str. viridans	?	Chronic	Clinical arrest
10	Staph. aureus, B. proteus, K. pneumoniae, type B, Clostridia	7	Chronic	Clinical arrest; no recurrence in 8 months
11	P. vulgaris, Ps. aeruginosa, Beta hem. streptococcus Nonhem. streptococcus	7	Chronic	Clinical arrest; no recurrence in 6 months

* In all cases treatment was by topical instillations.

scarlet fever. In spite of persistent treatment, the infection remained uncontrolled for four months. After the routine course of streptomycin therapy, the discharge ceased, and the infection has remained clinically arrested since.

Conclusion: Streptomycin is a promising adjuvant in the management of chronic otitis media. The persistence of Pseudomonas aeruginosa and Proteus vulgaris in middle ear infection is notorious, especially when they occur in combination with gram-positive cocci. Certain strains of the two organisms are rather insensitive to streptomycin; therefore, some infections due to these strains may be refractory to the drug in

the concentrations employed in this series of cases. It remains to be demonstrated whether greater concentrations are beneficial without harmful side effects.

MASTOIDITIS

Two patients with chronic otitis media complicated by mastoiditis are presented.

CASE 1.—A 26 year old man complained of persistent drainage of the right ear of two years' duration. When admitted to the hospital he had severe pain, fever and tenderness over the right mastoid process. Examination revealed a high attic perforation with inspissated pus and debris. There were signs of meningeal irritation. Culture of the drainage revealed a solitary organism, P. vulgaris, sensitive to streptomycin. Systemic streptomycin therapy, 0.125 Gm. given intramuscularly every three hours, was started, and radical mastoidectomy was performed. After the first postoperative dressing, supplementary topical applications of the drug were employed. The convalescence was uncomplicated, and the patient has remained symptom free.

The efficacy of streptomycin in case 1 is difficult to evaluate, but the rapid, uncomplicated convalescence is noteworthy.

CASE 2 (chart 1).—The patient was a 20 year old man. Acute mastoiditis developed, which was neither alleviated nor mitigated by penicillin therapy. Hemolytic Staphylococcus aureus and hemolytic streptococci were demonstrated in the aural discharge. Simple mastoidectomy was performed, and penicillin therapy was continued. The postoperativve course was hectic. There was a spiking temperature curve, rising to 105 F. on the eighth day of illness and one week after the operation. The patient's condition was critical. At this time a sensitivity test revealed that the organisms were penicillin fast but susceptible to streptomycin. The administration of penicillin was discontinued, therefore, and streptomycin given in the amount of 0.25 Gm. every three hours by intramuscular injection. This regimen was continued for eleven days, and there was an almost immediate clinical improvement, with lowering of the temperature. However, nuchal rigidity developed. The Queckenstedt sign became positive. Examination of the spinal fluid revealed 100 polymorphonuclear leukocytes. A diagnosis of thrombosis of the lateral sinus was made and confirmed on surgical intervention. The entire thrombophlebitic area was removed. The patient had an uneventful recovery.

Streptomycin therapy, aided by surgical measures, prevented general dissemination of the infection and effected a cure. The case illustrates the importance of close collaboration of the clinician and the bacteriologist.

Conclusion: Streptomycin is a valuable adjuvant to surgical intervention in the treatment of mastoiditis, provided the causative organisms are susceptible to the drug.

BRAIN ABSCESS

In table 3 are presented the data derived from 8 cases of solitary brain abscess. The causative organisms, tested in vitro, were susceptible to streptomycin. In cases 5 and 6 the organisms had been introduced

directly with embedded shell fragments. In cases 3 and 8 the abscesses were propagated by hematogenous spread from infections in the tibia and the lung, respectively. In cases 2 and 7 meningitis developed after infection of the upper respiratory tract and was followed by the formation of a brain abscess. Case 4 represents contiguous extension of an infection of the adjacent temporal bone. In 5 of the patients symptoms had been present for one to six weeks, while in the other 3 the duration was twenty-six, thirty-two and forty weeks, respectively. All the patients were critically ill.

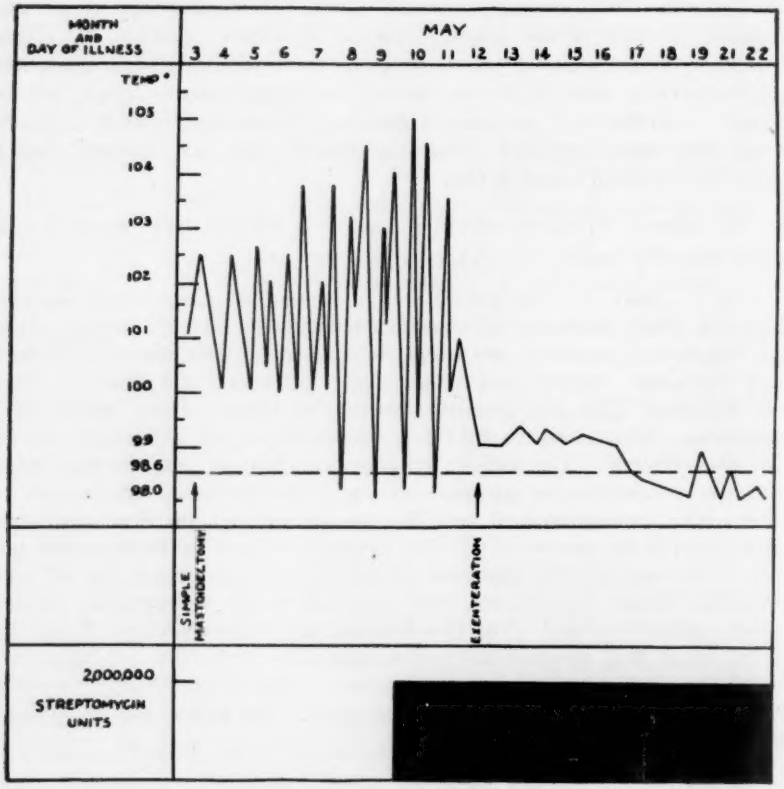

Chart 1 (case 2).—Mastoiditis and lateral sinus thrombosis.

Chemotherapy was given in conjunction with surgical removal of necrotic tissue. Streptomycin was administered intramuscularly to all patients for periods ranging from ten to forty-six days. Three patients (cases 3, 5 and 6) had supplemental local instillations of the drug. Five of the 8 patients received other chemotherapy prior to, and simultaneous with, the administration of streptomycin.

Seven of the patients recovered. One died of a progressive pneumonic consolidation (case 2). One patient (case 5) showed improve-

ment while streptomycin was given, but a relapse developed subsequently. This patient had an embedded shell fragment. After this foreign body had been removed, chemotherapy, both local and systemic, sterilized the cavity, which then became obliterated.

Conclusion: The role of streptomycin in the management of brain abscess cannot be fully defined from this series of cases, since some of these were of long standing and there was no improvement with prior revision, drainage and a chemotherapeutic regimen. It is postulated

TABLE 3.—*Brain Abscess*

Case	Etiologic Agent	Associated Condition	Duration, Wk.	Total Dosage of Streptomycin		Other Chemotherapy	Result
				Gm.	Days Treated		
1	Staph. aureus	Otitis media and mastoiditis, of which it was an extension	5.5	56.0	28	None	Improvement; abscess drained surgically
2	Staph. aureus	Infection of upper respiratory tract	3	22	11	Penicillin, sulfadiazine	Death with progressive pneumonic consolidation
3	Staph. aureus, E. coli	Pyemia	26	72.4	25	None	Improvement after surgical drainage
4	Staph. aureus	Continuous osteomyelitis	4	41	41	Penicillin, sulfadiazine	Good; abscess resolved on operation
5	Staph. aureus, Ps. aeruginosa, A. aerogenes	Shrapnel wound of area	32	14.2	20	None	Doubtful; temporary improvement with reactivation after withdrawal of drug
6	Staph. aureus, K. pneumoniae	Shrapnel wound of area	40	66.2	47	Penicillin, sulfadiazine	Improvement after removal of necrotic bone and drainage of abscess
7	Hemolytic streptococcus, anaerobic gram-negative bacillus	Acute sinusitis	2	12.6	15	Penicillin	Improvement after craniotomy
8	Not determined	Bronchiectasis	1	10	10	Penicillin, sulfadiazine	Improvement after trephine drainage

that streptomycin did sterilize residual abscess walls and tracts. The drug, then, is a valuable adjuvant to surgical procedure. It is not unreasonable to assume that, as in the case of penicillin, streptomycin will minimize the extent of surgical treatment in cases in which the causative organisms are susceptible, provided all reaches of the infection are attainable. It is emphasized that a high concentration of the drug at the site of the infection is best attained by direct injection.

MENINGITIS

Eleven patients with meningitis received streptomycin. In 3 cases the causal organisms were found to be Haemophilus influenzae and in

2 cases Escherichia coli; Ps. aeruginosa, hemolytic streptococci, Aerobacter aerogenes, Staphylococcus aureus, Klebsiella pneumoniae and Cryptococcus hominis were isolated in the remaining cases (table 4). Three of the patients were infants, while the remaining ones were young adults. In 9 of the patients the infectious process was acute, that is, of less than two weeks' duration, while 2 had had the infection for twenty-one and sixty days, respectively. Both primary and secondary types of the disease are represented in this group. All patients

TABLE 4.—*Meningitis*

Case	Organism	Age, Yr.	Type	Duration, Days	Chemotherapy: Streptomycin, Gm.*	Chemotherapy: Other	Result
1	H. influenzae	7/12	Primary	10	0.8 i.m. daily Total: 9.3, 12 days	None	Residual low grade fever
2	H. influenzae	22	Primary	9	1.2 i.m. daily 0.05 i.t. daily Total: 9.8, 9 days	None	Recovery
3	H. influenzae	7/12	Primary	2	1.6 i.m. daily 0.1 i.t. daily Total: 21.9, 11 days	Sulfadiazine, H. influenzae antiserum	Death
4	E. coli	19	Secondary to bacteremia from osteitis of tibia	5	1.0 i.m. daily 0.65 i.t. daily Total: 18.9, 16 days	Sulfadiazine	Dramatic response
5	E. coli	1/26	Primary	8	0.150 i.m. daily Total: 1.95, 13 days	Penicillin, sulfadiazine	Cure
6	Ps. aeruginosa	21	Secondary to wound	1	1.6 i.m. daily 2.0 i.v.; 0.05 i.t. Total: 17.35, 10 days	None	Recovery
7	Hemolytic streptococcus	26	Complication of brain abscess	6	1 i.m. daily Total: 28, 28 days	Penicillin, sulfadiazine	Recovery
8	A. aerogenes	29	Complication of laminectomy	5	0.8 i.m. daily 0.05 i.t. Total: 0.55, 9½ hr.	Penicillin, sulfadiazine	Death
9	Cryptococcus hominis	26	Primary	60	1.8 i.m. daily 0.25 i.t. daily Total: 9.75, 5 days	Penicillin, sulfadiazine	Death
10	Staph. aureus (coag. positive)	20	Secondary to mastoiditis	21	3.2 i.m. daily 0.25 i.t. daily Total: 58, 19 days	Penicillin	Dramatic response
11	K. pneumoniae	21	Primary	2	4.0 i.m. daily 0.1 i.t. daily Total: 59.3, 14 days	Penicillin, sulfadiazine	Recovery

* i.m. means the doses were given intramuscularly; i.t., intrathecally; i.v., intravenously.

were critically ill at the time streptomycin therapy was initiated. In general, the dosage of streptomycin was 1 Gm. or more a day except in the case of the infants, who received comparatively larger doses. All the patients received the drug intramuscularly. In 8 instances the drug was injected into the cerebrospinal circulation as well. Several patients had a continuation of prior medications, on which, however, they had not made favorable progress. The administration of these drugs was not necessarily continued throughout the period of streptomycin administration. Eight patients recovered, while 3 died. One of the patients who died (case 8) was moribund at the time treatment

was begun. He lived only nine and one half hours. The second (case 9) was infected with C. hominis, which is known to be refractory to streptomyocin in vitro; no benefit should have been expected. The third patient to die, a 7 month old boy (case 3), succumbed in spite of prompt and adequate streptomycin therapy, given in combination with sulfadiazine and H. influenzae serum. This patient's death represents the only true failure in this series. It suggests that in certain instances the underlying pathologic changes have progressed to such an extent

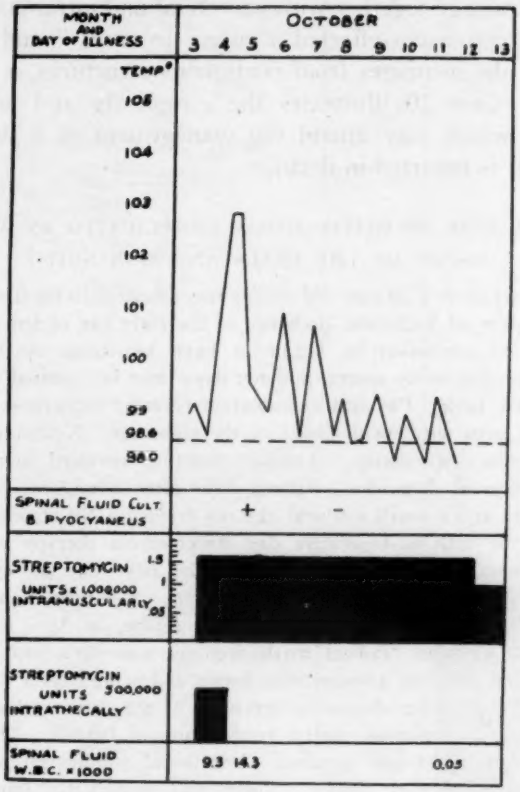

Chart 2 (case 6).—Meningitis secondary to a penetrating wound of the spine.

that death will occur in spite of the removal of the bacterial components of the disease. The corrected mortality rate is therefore 11.1 per cent (1 death in 9 cases). Two of the patients with H. influenzae infection showed progressive clinical improvement following the administration of streptomycin (cases 1 and 2). The temperature subsided by lysis. Both patients had received penicillin in spite of the fact that H. influenzae is usually refractory to it, as well as to sulfadiazine. No beneficial effect of this routine was perceivable. Two patients with E coli infec-

tion improved dramatically with streptomycin therapy. A 2 week old infant recovered from intramuscular administration alone. It may be of importance that the dose administered to this infant when calculated on the basis of weight represents two to three times the dose usually administered to adults. Within five days after the institution of treatment the patient was clinically well, and the blood and spinal fluid cultures became and remained sterile. One patient (case 6; chart 2) had a draining sinus over the lumbar vertebrae with a dural communication. This was the result of a shell fragment wound. Combined revision and drainage together with parenteral and intramuscular administration of streptomycin effected a cure. In cases 7 and 10 infection extended into the meninges from contiguous structures, a usually fatal development. Case 10 illustrates the complexity and multiplicity of complications which may attend the management of a disease of the middle ear. It is reported in detail.

REPORT OF A CASE OF OTITIS MEDIA COMPLICATED BY MASTOIDITIS, ABSCESS OF THE BRAIN AND MENINGITIS

CASE 10 (chart 3).—A 20 year old soldier was admitted to the hospital, March 8, 1946, with a history of a chronic discharge of the right ear of ten years' duration. A week prior to admission he began to have headaches on the right side. These became progressively severe, and ten days later he vomited and complained of stiffness of the neck. Physical examination revealed tenderness over the right mastoid process with purulent drainage of the right ear. Neurologic examination showed no definite abnormality. Lumbar puncture revealed increased pressure but otherwise normal dynamics. Fifteen days after admission, simple mastoidectomy was done and a small epidural abscess drained. No striking improvement followed. On the fifth postoperative day streptomycin therapy was started, 3.2 Gm. being injected daily intramuscularly. The next day an epidural and an occipital lobe abscess were drained. In the interim a roentgen examination showed osteomyelitis of the involved mastoid bone. Therefore, on April 8, ten days after the simple mastoidectomy, radical mastoidectomy was performed. Improvement ensued until April 28 when a ventricular fistula and a high fever developed. Further roentgen investigation showed progression of the osteomyelitis. Three days later the patient was comatose, with a temperature of 105.6 F. The cerebrospinal fluid was found to be grossly purulent. Intrathecal administration of streptomycin was started (0.25 Gm. daily). There was remarkable improvement. On May 2 a large area of osteomyelitic bone was excised from the posterior parietal region, which gave direct drainage of the occipital lobe cavity. The scalp flap was swung over and the wound sutured, closing the previous mastoidectomy incision and covering the ventricular fistula. A drain was passed through the enlarged aural canal under the scalp flap and left. This was retained in place for two days; it was then removed, at which time the ventricular fistula was closed. The only drainage was from the external canal. This was minimal and subsided rapidly. The intrathecal injections of streptomycin were discontinued on May 9. Uneventful recovery ensued.

This case emphasizes (1) the complexity and multiplicity of complications which may attend the management of a disease of the middle

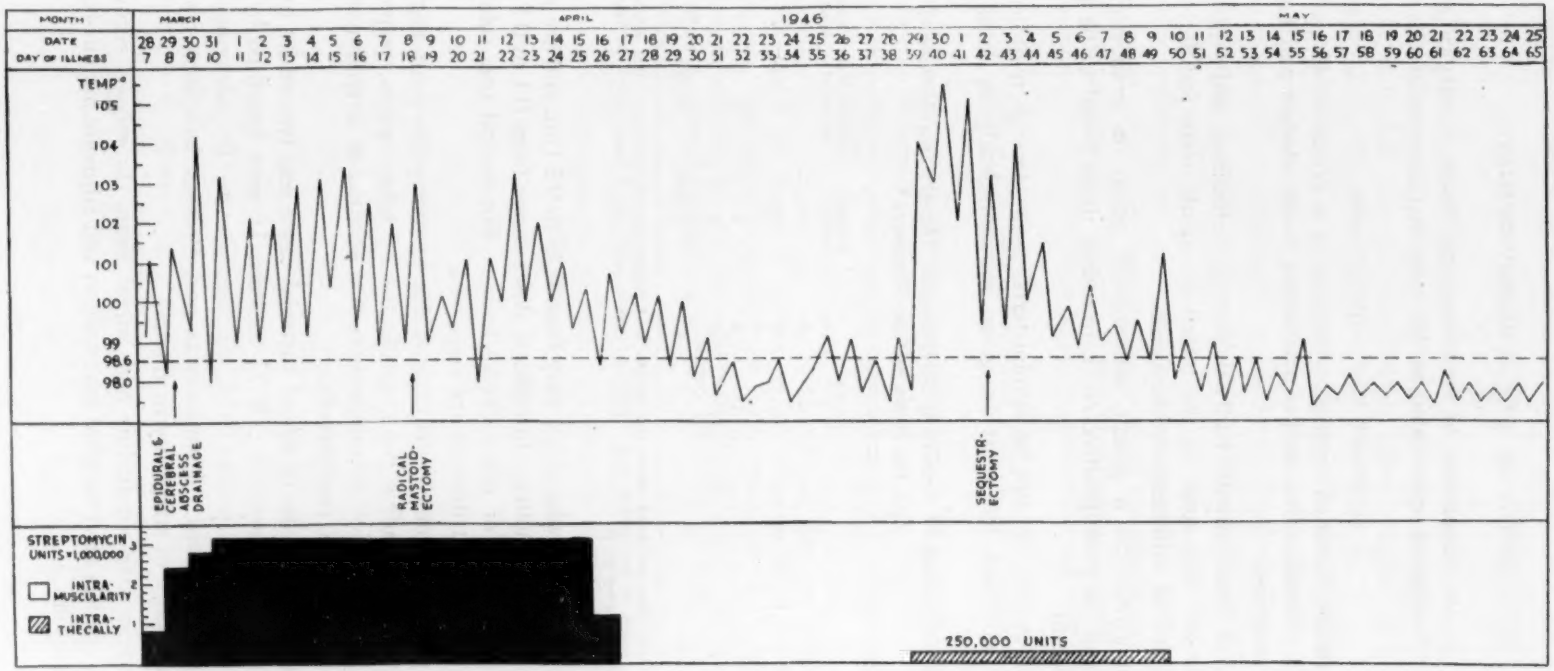

Chart 3 (case 10).—Meningitis and brain abscess due to chronic mastoiditis and otitis media.

ear and (2) the importance of immediate and thorough surgical treatment, which was not appreciated in the early management of this case.

SUMMARY AND CONCLUSIONS

The results obtained with streptomycin in a group of 41 patients with otitis externa, otitis media, mastoiditis, brain abscess and meningitis are presented.

Many of these patients had polybacterial infections, and sensitivity tests indicated that some of the infectious agents were indifferent to penicillin and to sulfonamide compounds.

Streptomycin has a potent antibacterial action on gram-negative bacteria and on gram-positive cocci, including those found to be penicillin resistant.

Streptomycin may not be administered orally for the treatment of systemic infections but must be given intramuscularly or locally or topically. Intramuscular doses vary from 0.25 to 0.5 Gm. and are given every three to four hours. Intrathecal doses range from 0.1 to 0.5 Gm. and are given daily or every twelve hours. For topical use, solutions and plasma powder triturates are employed.

TABLE 5.—*Summary of Results of Streptomycin Therapy in Infections of the Ear, the Brain and the Meninges* *

	Cases	Patients Benefited	Patients Not Benefited	Number Who Died
Otitis externa	5	5	..	..
Otitis media	13	11	2	..
Mastoiditis	3	3	..	..
Brain abscess	8	6	1	1
Meningitis	12	9	..	3
Total	41	34 (84%)	3 (7%)	4 (9%)

* This table was prepared after the article was ready for publication. The reader will note that 2 cases of meningitis and 2 cases of otitis media have been added, bringing the total number of cases to 41.

In 5 patients chronic otitis externa due to susceptible gram-negative bacilli and gram-positive cocci, unaffected by other agents, responded favorably to the topical administration of a solution of streptomycin (5 micrograms per cubic centimeter).

Chronic otitis media of mixed bacterial cause was treated by topical application of streptomycin. Of 13 patients, 11 were benefited by this therapy, while in a patient with infection due to Ps. aeruginosa no improvement resulted. Pseudomonas and Proteus infections respond less dramatically to streptomycin therapy.

A patient with mastoiditis and lateral sinus thrombosis recovered without a sequela after surgical intervention and adjuvant administration of streptomycin.

Eight patients who had solitary brain abscess of varied bacterial cause and associated primary lesions received systemic or combined systemic and local streptomycin therapy after surgical drainage and wound revision. Recovery occurred in 7 and death in 1.

Our experiences with streptomycin therapy in cases of nontuberculous bacterial meningitis due to susceptible organisms confirm the favorable results reported in the literature by others.[4] Best results are obtained with combined systemic and local (intrathecal) administration of the drug.

Streptomycin is a valuable addition to the therapeutic armamentarium for infections of ear, meninges and brain when the infections are due to susceptible organisms. The importance of adequate surgical treatment in conjunction with chemotherapy is emphasized in the management of these infections.

Our findings in general confirm and extend the published observations.[5]

Surgical Research Unit, Brooke General Hospital, Brooke Army Medical Center, Fort Sam Houston.

---

4. (*a*) Alexander, A.: Meningitis Due to Escherichia Coli Treated with Streptomycin, J. A. M. A. **131**:663 (June 22) 1946. (*b*) Alexander, H.; Leidy, G., and Donovick, R.: Meningitis Due to Hemophilus Influenzae, ibid. **132**:434 (Oct. 26) 1946. (*c*) Keefer, C. S., and others: Streptomycin in the Treatment of Infections, ibid. **132**:4 (Sept. 7) 1946. (*d*) Nussbaum, S.; Goodman, S.; Robinson, C., and Ray, L.: Influenzal Meningitis: Report of Three Cases Treated with Streptomycin and Sulfadiazine, J. Pediat. **29**:14 (July) 1946. (*e*) DeBakey and Pulaski.[1a]

5. Weinstein, L.: Treatment of Meningitis Due to Hemophilus Influenzae with Streptomycin: A Report of Nine Cases, New England J. Med. **235**:101 (July 25) 1946. Alexander.[4a] Alexander and others.[4b] DeBakey and Pulaski.[1a] Keefer and others.[4a] Nussbaum and others.[4d]

EVALUATION OF DIAGNOSTIC METHODS USED IN CASES OF MAXILLARY SINUSITIS, WITH A COMPARATIVE STUDY OF RECENT THERAPEUTIC AGENTS EMPLOYED LOCALLY

SAMUEL BURTOFF, M.D., M.Sc. (Med.)
WASHINGTON, D. C.

ONE HUNDRED PATIENTS who presented themselves at the ear, nose and throat clinic of the United States Army General Dispensary, Washington, D. C., became the subjects of a study in which the accepted methods of diagnosing maxillary sinusitis were evaluated. They were selected for this study over a period because of symptoms suggesting an early stage of sinusitis.

The accepted methods of diagnosing maxillary sinusitis are of two types: subjective and objective. The subjective method is the analysis of the history. The objective methods are (1) transillumination, (2) anterior rhinoscopy, (3) roentgenography with and without iodized poppyseed oil 40 per cent and (4) exploratory irrigation. The last of these objective methods of diagnosis, involving the use of various solutions for irrigation of and instillation in the maxillary sinuses, led to an interesting comparison of these solutions with respect to their therapeutic value.

A study of the erythrocyte sedimentation rate, of the white leukocyte blood count and of the differential blood count was made for each patient both at the beginning and at the end of the treatment; a cultural study of the antral return was made at the first visit. Ephedrine, 1 per cent in saline solution, was given for home use as a vasoconstrictor.

REVIEW OF PERTINENT FACTS REGARDING THE MAXILLARY SINUS

A review of the anatomy and the physiology of the maxillary sinus, the largest of the paranasal sinuses, is here presented before continuing with a discussion of the procedure used in evaluating the diagnostic methods. Ballenger[1] described the maxillary sinus as an irregular-

From the General Dispensary, United States Army, The Pentagon, Washington, D. C.

Thesis submitted to the Faculty of the University of Pennsylvania Graduate School of Medicine in partial fulfilment of the requirements for the degree of Doctor of Medical Science (D.Sc. [Med.]) for graduate work in otolaryngology.

1. Ballenger, W. L., and Ballenger, H. C.: Diseases of the Nose, Throat and Ear, ed. 8, Philadelphia, Lea & Febiger, 1943, pp. 7-22.

shaped pyramid whose base faces the nasal fossa and whose apex lies on the zygomatic process of the maxilla. The maxillary ostium is a true canal in the upper anterior part of the median sinus wall and leads from the antrum into the infundibulum of the middle meatus. There may be one or more accessory ostiums lying posterior to the maxillary ostium.

A review of the physiology of the mucous membrane of the maxillary sinus is helpful in explaining the reaction of the tissues to varied influences. The epithelium of the antral mucous membrane is ciliated; the motion of the cilia aids in carrying the scanty secretion to the maxillary ostium at the top of the sinus, where the secretion is discharged through the infundibulum into the middle meatus. If the cilia are injured or destroyed, the secretions are retained within the sinus and accumulate.

When the sinuses are open to ventilation and drainage, the inflammatory processes within them occur less frequently, because the continuity and destructiveness of the inflammatory process depend largely on lack of normal ventilation and drainage.

USUAL PROCEDURE IN THE DIAGNOSIS OF MAXILLARY SINUSITIS

SUBJECTIVE FINDINGS

History.—A history was secured in all of the 100 cases studied. All of the patients stated that they had had head colds before the then present symptoms arose. The colds had lasted for a period of two to six weeks in most instances; in some cases they had lasted much longer in spite of continued self-medication with nose drops (ephedrine or any other solution producing shrinkage) and with cold capsules (acetylsalicylic acid 3 grains [0.19 Gm.], acetophenetidin 2 grains [0.13 Gm.] and caffeine ½ grain [0.03 Gm.]). Those patients who complained of a continuous head cold had had a continuing anterior and postnasal discharge; the postnasal discharge was so disturbing that the patients had nausea with vomiting, usually following breakfast. Some patients complained of sore throats due to pharyngitis with or without inflammation of the lateral bands; some had inflammation of the palatine tonsils; some had persistent cough with no involvement of the larynx. Some patients had had bronchitis, which was at times disturbing since it had not responded to the usual expectorants with codeine sulfate, ¼ grain to a teaspoon, taken every four hours. Some patients complained further of asthmatic attacks; some had had acute and chronic laryngitis with no bronchial involvement; some suffered from neurasthenia, with or without loss of weight (there being no history and no objective findings of constitutional diseases). And still other patients had these various complaints: sensation of fulness in the ear with or without vertigo; arthritis; myalgic and neuritic pain, with or without previous history; low grade fever, between 99 and 100 F.

OBJECTIVE FINDINGS

Rhinoscopy.—From the objective angle the study of each patient began with anterior rhinoscopy. This revealed the presence or the absence of pus in the nasal vestibule. Purulent secretion was most commonly found in the middle meatus, along the edges and medial sides of the anterior turbinate, simulating a curtain with fringes, and also in the posterior choana and along the floor of the nasal vestibule. Pus in the middle meatus was aspirated; if it appeared within a few minutes under the middle turbinate, this appearance was considered diagnostic, ruling out anterior ethmoid and frontal sinusitis. In 72 per cent of the cases studied, when pus appeared in the middle meatus it was also present in the antrum.

Transillumination.—The next diagnostic aid employed was transillumination. The system of grading consisted in determining whether the transillumination was clear, hazy or cloudy when light was transmitted from the outer cheek into the mouth. The bulb was placed over two areas: first, above the infraorbital ridge, with the beam of light directed against the orbital floor; second, over the anterior facial wall in the region of the canine fossa. The light reflected over the palate with both positions was observed and graded for clarity.

The degree of transillumination is not an accurate diagnostic confirmatory finding. In 29 per cent of the cases the transillumination was cloudy to hazy, while the antral return was clear. In another 29 per cent the transillumination was clear and therefore indicated no content, while irrigation proved purulent secretion to be present.

In 42 per cent of the cases in which transillumination was hazy to cloudy and indicated, therefore, the presence of secretion, irrigation confirmed the presence of content, which content proved to be purulent. This low incidence of confirmation (42 per cent) may be explained on the grounds of anatomic pathology and the nature of the secretion in the antrum. When transillumination was cloudy and the return clear, it was learned by roentgenogram that the cloudiness was due to possible hyperplastic membrane, or to polypoid tissue, or to a tumor, or to a small sinus with thickened skeletal bone. Transillumination may be inaccurate as a diagnostic aid, but a positive finding, namely a cloudy condition, should be followed up with exploratory irrigation.

Roentgenography.—Roentgenography of the nasal accessory sinuses is defined as a shadow transposition of the differential densities of the bones of the skull as modified by certain diseases or conditions. The contents of a sinus, whether pus or isotonic solution of sodium chloride, will offer some degree of obstruction to the roentgen ray. Radiopaque oils are of great value in roentgenography of the sinuses since they outline a cavity sharply so that the thickness of the mucous membrane

and the presence of polypi or of tumors may be determined; irregularities in size and shape can be accurately outlined.

Roentgenograms *B* and *C* accompanying this paper are studies of patients who have had a contrast medium injected into the sinuses and who have then had roentgenologic examinations in Waters' position. Roentgenograms *B* and *C* show the pathologic state and the capacity of the antrum prior to and after treatment, respectively. The average capacity of the antrum is from 15 to 25 cc. If one sinus is found to hold 30 cc. and the other 5 cc., without roentgen evidence the difference in capacity may be considered as due to hyperplastic or to polypoid tissue or to neoplasm. With the aid of a contrast medium the roentgenogram shows the content as well as the pathologic process, and this is of great value in determining the prognosis and the form of therapy needed.

The roentgenogram being positive and the history indicating possible maxillary sinusitis, exploratory irrigation followed; or, again, if either transillumination or the results of anterior rhinoscopy were positive together with the roentgenogram, irrigation was indicated.

Roentgen readings of maxillary sinusitis were confirmed in 86 per cent of the cases studied. Since thickened, or hyperplastic, membrane, suppurative content of the sinus and tumor offer obstruction to the roentgen ray, roentgenographic diagnosis is reliable and does justify exploratory irrigation. Johnson [2] made an analysis of the results of 853 successive roentgen examinations of the sinuses in cases in which the clinical records were complete, in order to determine their value in diagnosis. His routine projections were the Waters, Rhese, vertico-mental and lateral. He found that the roentgenographic and the clinical diagnosis are closely parallel in as much as 80 per cent.

In the series of roentgenograms considered here, *A* was a flat plate, usually made at the time of the first examination. *B* and *C* were made with a contrast medium, a radiopaque oil which was two thirds iodized poppyseed oil 40 per cent and one third cottonseed oil. On a flat plate, *A*, "cloudy" or "hazy" means merely loss of air content. On the flat plate it is difficult to distinguish between a pathologic condition of the sinus due to excessive swelling of the mucosa, one due to a neoplasm or one due to the accumulation of fluid; on use of a contrast medium one can make these distinctions. Before taking a roentgenogram with a contrast medium, saline irrigation was used to determine the presence of pus.

Irrigation.—An exploratory irrigation was made in those cases in this study in which maxillary sinusitis was evidenced by the history, or by transillumination, or by the results of anterior rhinoscopy, or by roentgenograms.

---

2. Johnson, V. C.: The Value of Roentgen Examination of Paranasal Sinuses, Radiology **32**:303-310 (March) 1939.

Irrigation of the sinus with isotonic solution of sodium chloride, with the cannula inserted through the natural ostium or through the nasal wall, always preceded use of other irrigants; with one group this saline solution was the initial irrigating solution. Irrigation proved both diagnostic and therapeutic. On the use of isotonic solution of sodium chloride, if pus was returned, confirming a previous diagnosis of maxillary sinusitis, a contrast medium was injected into the nasal antrum through the same cannula. Roentgenography was again used to determine the filling defect. The quantity of oil instilled was recorded. This same study with a radiopaque medium was used in comparison with a still later one, made after the treatments were completed. The quantities of oil shown in this and the later one were also compared.

The capacity of the antrum in the series studied was found to range from 3 cc. during inflammation to 35 cc. when the inflammation had subsided, which marked the end of treatment. If both maxillary sinuses appeared to be symmetric in size and form on flat roentgenograms, a prognosis could be made from the quantity of oil which the nasal antrum retained; the greater retention gave a more favorable prognosis. Capacity for retention proved to be a satisfactory objective finding.

Discussion of the Technics of Irrigation: Seventy-five per cent of the irrigations were done through the natural ostium or through the accessory ostium. Pierce's cannula was used, double-curved, rigid and of stainless steel. If the natural or the accessory ostium was not accessible, a puncture was made through the nasoantral wall in the inferior meatus, with either a straight or a curved trocar.

At no time was the middle meatus used for the approach if this entailed the possibility of trauma to the surrounding structures; in cases in which the middle meatus was not visualized because of an enlarged bulla ethmoid cell with marked deviation of the septum, or because of marked hypertrophy of a middle turbinate which was wedged in between the septum and the lateral nasal wall, then the puncture was made through the nasoantral wall underneath the inferior turbinate. To avoid puncturing the membranous partition at the tip of the uncinate process, one must take care to consider the posture of the head, since a high entrance may lead into the orbital cavity itself; the irrigating fluid would get into the periorbital tissue, and an immediate swelling of the infraorbital tissue would occur. Similar swelling occurs in the anterior facial wall of the maxillary sinus when one irrigates through the nasoantral wall by way of the inferior meatus.

A great number of rhinologists do not approve of irrigating through the natural ostium because of possibility of the following complications: periorbital infiltration with the irrigating solution, emphysema, osteomyelitis, embolism or even trauma of the mucosa with closure of the

natural ostium. These possible complications did not arise in this study, nor in 1,000 irrigations prior to this study.

Bowers [3] made a study of 2,580 patients whose antrums were irrigated through the natural ostiums with no ill effects. He, too, stated that there is no danger in irrigating through the middle meatus if the irrigation is done carefully. In this study the natural ostium or a puncture made through the nasoantral wall in the inferior meatus was used. The use of the natural ostium is perhaps more difficult, since it requires complete familiarity with the immediate anatomy, but once the technic is mastered, it is the least dangerous. The puncture of the inferior meatus requires a sharp instrument, which is in itself a source of danger; too many complications may result, such as emphysema, penetration of the anterior facial wall with infiltration of the tissue resulting in orbital cellulitis, air embolisms and possibly osteomyelitis.

Before irrigating the maxillary sinus, the middle meatus was anesthetized with a pledget wetted in a 10 per cent solution of cocaine hydrochloride. Where this was not possible, the inferior meatus was anesthetized with the same drug. The nose, the anterior nares and the upper lip were cleansed with 70 per cent alcohol. The sinus was then irrigated with saline solution by means of a cannula or a trochar, depending on the route chosen into the maxillary sinus. A specimen of pus, from the return, was placed in a sterile tube which contained veal infusion broth (p_H 7.6); this tube was sent to the laboratory for bacterial study. In the majority of cases the sinus was irrigated through the natural ostium with saline solution until there was a clear return. The saline solution had been warmed to body temperature; the quantity used was from 200 to 300 cc.; so large a quantity was used in order to displace the secretion (whether this was purulent, organized or suspended) and also to reduce the viscosity of the secretion, thereby aiding it to drain through the natural or the accessory ostium. It is possible that in some instances the purulent secretion adheres to the membranous wall of the sinus and the flow of the water helps to detach it. It is also possible that the saline solution acts as a stimulant to the cilia and reinitiates the normal physiologic processes of the cilia.

Hematologic Examination: The Erythrocyte Sedimentation Rate, the Blood Leukocyte Count and the Differential Count.—Sinusitis is an infection; since both the rate of erythrocyte sedimentation and the leukocyte count increase with localized acute infection, the correlation of these blood studies with a diagnosis of maxillary sinusitis might prove of value. The differential count and the leukocyte count were secured

3. Bowers, W. C.: Lavage of the Antrum with a Blunt Instrument Through the Middle Meatus: A Series of 2,580 Cases, Ann. Otol., Rhin. & Laryng. **49**: 1036-1037 (Dec.) 1940.

together with the sedimentation rate at the beginning and at the end of treatment.

All of the patients in this series proved to have leukocytosis at the first count; the count was 10,000 to 18,000. The differential count was normal in most cases. The rate of sedimentation was high in all cases, from 19 to 50 mm. per hour by the Wintrobe and Landsberg [4] method, with hourly readings only. Where associated diseases were present rather than sinusitis, the sedimentation rate ranged from 12 to 18 mm. per hour; this variation in rate between true sinusitis and conditions such as nasopharyngitis, laryngitis, tracheitis and bronchitis of catarrhal type and of moderate severity helped in the differential diagnosis. The differential leukocyte count was not important as a diagnostic aid since it hardly varied from the beginning to the end of treatment. But the white cell count was helpful since it became normal, or decreased considerably, by the end of treatment. Each protocol of the twenty-four included at the end of this discussion contains figures for the white blood cell count, the differential count and the erythrocyte sedimentation rate as found at the beginning and at the end of treatment.

There was a correlation between the rate of sedimentation and the type of antral return. An antral return containing purulent secretion was usually associated with a high sedimentation rate. However, the sedimentation rate did not necessarily become normal when the antral return was clear; but usually a normal sedimentation rate was found when the sinus was free of infection.

As the sedimentation rate decreased to normal, the roentgenogram (with a contrast medium) correspondingly showed improvement in the filling defect. A few patients who after several treatments had a clear antral return with a high sedimentation rate and no roentgenographic improvement were told to return for continued check of the sedimentation rate, and the treatments of the sinuses were discontinued during that time. When their sedimentation rates were normal, usually after two or three weeks, roentgenograms were again made (with a contrast medium); the filling defect then showed great improvement, the thickness of the mucosa having decreased by 2 to 8 mm.

In many cases of nonresolving nasopharyngitis, there was an antral return containing purulent material with an anterior rhinoscopic study and transillumination giving no evidence of disease, while the roentgenogram showed a slight haze over the antrum; in these instances the white cell count and the differential count were within normal range, while the sedimentation rate was slightly higher than normal, about 14 to 18 mm. per hour. This sedimentation rate would indicate that the infection was an associated disease rather than true sinusitis.

4. Wintrobe, M. M., and Landsberg, J. W.: A Standardized Technique for the Blood Sedimentation Test, Am. J. M. Sc. **189**:102-115 (Jan.) 1935.

The sedimentation rate therefore becomes an important diagnostic and prognostic factor. While it does not indicate the locus of the infection, it is obviously a check on the state of the pathologic process of the sinal mucosa when the increase is due to maxillary sinusitis. The sedimentation rate increases with the acuteness of the infection.[4] It follows the course of the sinus involvement, decreasing to normal as the sinus improves.

Cultural Study.—A bacteriologic study of the maxillary sinuses is not a diagnostic aid but does indicate the type of organism found in the antral return and thus enables the practitioner to determine the therapeutic agent which might be effective against the infection. The bacteria found in the antral return, from bacterioscopic examination of the empyema as found in the antral return, are listed in the accompanying table, with the percentage for each type.

Results of Bacteriologic Study of Antral Returns of One Hundred Patients with Maxillary Sinusitis

Organism Identified	Percentage
1. Pseudomonas aeruginosa	18
2. Staphylococcus albus	16
3. Staphylococcus aureus	16
4. Alpha hemolytic streptococci	12
5. Beta hemolytic streptococci	9
6. Aerobacter aerogenes	9
7. Nonhemolytic streptococci	8
8. Haemophilus influenzae	7
9. Diphtheroids	2
10. Nonpathogenic Neisseria	1
11. Escherichia coli	1
12. Proteus morganii	1

In spite of the number and the variety of bacteria found in the antral returns, which would lead one to expect that a bactericidal or bacteriostatic agent might hasten resolution of sinusitis, the studies proved that this was not the case. A nonbactericidal and nonbacteriostatic agent, such as isotonic solution of sodium chloride, used locally was just as effective in bringing about this resolution as the solution of sulfathiazole and that of penicillin (both bacteriostatic) also used locally; once the sinusitis had subsided there was no flare-up on discontinuance of treatment with the isotonic solution.

COMPARATIVE STUDY OF RECENT THERAPEUTIC AGENTS EMPLOYED LOCALLY

GRADING ANTRAL RETURNS

The second part of the study was concerned with the secretions found within the maxillary sinus and also with an evaluation of the effectiveness of the various irrigating solutions. After irrigation and collection of the antral return, the return was graded from clear, or

zero, which indicated absence of infection, to 4 plus (++++); all grades between zero and 4 plus indicated infection. A 1 plus (+) return contained shreds of pus; a 4 plus (++++) return was highly purulent, foul or not, and the pus might be in a state of suspension as in acute maxillary sinusitis, or organized as in chronic sinusitis. The origin of the return did not affect its grading; thus a return from a sinus in which the membrane was pathologic, whether the condition ranged from slight thickening to hyperplasia so extreme as to fill the sinus completely, was graded zero if the return was clear.

When the antral return was purulent, whether from a sinus acutely infected or a sinus chronically infected, the patient was scheduled for further study and treatment; he was placed at random with any of the four groups of 25 patients who were to receive initial treatment with isotonic solution of sodium chloride, 5 per cent sulfathiazole in iodized oil, 5 per cent sodium sulfathiazole in saline solution and penicillin in saline solution, respectively.

COMPARISON OF THE SOLUTIONS USED

Clinical and roentgenographic observations following the use of these four solutions (saline solution, 5 per cent sulfathiazole in iodized oil, 5 per cent sodium sulfathiazole in saline solution, penicillin in saline solution) in the treatment of maxillary sinusitis, whether chronic or acute, are shown on the individual case records; a discussion of the procedure used follows.

Twenty-five patients were treated initially with one of the four solutions; in all there were 100 patients. If in any one group the sinus of a patient did not respond to treatment with the solution in use, the patient was placed with one of the other groups, and so on down, until he had had treatments with all four solutions unless he had improved on use of one of the remaining three. As to subjective factors, notations were made in answer to these questions: How did the patient feel following treatment with any one of the four solutions? Did the original complaint subside, disappear or undergo change? Objectively, these questions were answered: Was purulent secretion present in the nasal vestibule following treatment? What were the results of the antral irrigation and what was the grade of the antral return? How many irrigations were necessary before the antral return cleared? In the roentgenogram made at the end of treatment were there differences in the filling defect which would indicate the extent of improvement?

Sulfathiazole in Iodized Oil.—One of the groups of 25 patients was treated initially with 5 per cent sulfathiazole in iodized oil. This suspension was placed in the maxillary sinus through the irrigator, following a routine irrigation of the sinus with isotonic solution of sodium chloride. Three days later this same procedure, routine saline irrigation

followed by treatment with 5 per cent sulfathiazole in iodized oil, was repeated. Two weekly treatments followed, at the end of which time routine irrigation with saline solution produced an antral return which in most instances was clear. Then the maxillary sinus was filled with the 5 per cent sulfathiazole in iodized oil and a roentgenogram made to determine the action of the suspension on the sinal mucosa, to be compared with the initial roentgenogram. If after these treatments (four in all) the sinusitis persisted, the patient was placed with the group to be treated with 5 per cent sodium sulfathiazole in saline solution as described later in this paper.

At this point one should consider the possible effects of treating diseased sinuses with iodized oil alone. When the subject was presented by Goodyear,[5] it became a matter of controversy among such men as Van Alyea,[5] Proetz,[5] Arthur,[5] Walsh [5] and Spencer [5]; all agreed that its benefits were not due to bactericidal power of the iodized oil but to some other factor, possibly to improvement of the ostium, as suggested by Van Alyea, or possibly to the mechanical displacement, or possibly to a stimulating effect of the iodine on the mucous membrane.

Adding sulfathiazole as was done in the study would supposedly add bacteriostatic power to the already established therapeutic value of iodized oil in the treatment of diseased sinuses. Chemotherapy has been employed to advantage in cases of maxillary sinusitis for the past seven years. As early as 1938 Childrey,[6] in reporting a case of maxillary sinusitis, showed that bacteriologic tests proved the presence of chain streptococci and gram-positive bacilli; he reported improvement following irrigation with a solution of sulfathiazole. Similar reports were made by Spink and Paine [7] and Turnbull.[8]

It is known that sulfonamide compounds inhibit the growth of bacteria; their action is not by bacteriolysis but by bacteriostasis; sulfonamide compounds prevent the multiplication of disease-producing organisms and lessen their potency. Recovery is then brought about more easily by the normal phagocytic powers of the body cells. It is also known that the action of the sulfonamide compounds is interfered with or lessened in the presence of pus; the initial irrigation of the nasal antrum with the isotonic solution of sodium chloride removes the pus and thus presents a more favorable medium for the action of the sulfathiazole.

---

5. Coodyear, H. M.: Use of Iodized Oil in the Treatment of Infections of the Nasal Antrum, Arch. Otolaryng. **34**:1133-1143 (Dec.) 1941.

6. Childrey, J. H.: Sulfanilamide in Treatment of Sinusitis, Bull. Pract. Ophth. **8**:33 (April) 1938.

7. Spink, W. W., and Paine, J. R.: The Local Use of Sulfathiazole in the Treatment of Staphylococcal Infections: Preliminary Report, Minnesota Med. **23**: 615-619 (Sept.) 1940.

8. Turnbull, F. M.: Intranasal Therapy with Sodium Salt of Sulfathiazole in Chronic Sinusitis, J. A. M. A. **116**:1899-1900 (April 26) 1941.

Both clinical and roentgenographic improvement was noted in this series following the use of sulfathiazole in iodized oil. Clinically, the patients reported their condition improved in twenty-four to forty-eight hours after treatment; at that time little purulent secretion was evident in the nasal vestibule; there was no further complaint of obstruction of breathing; there was general amelioration of all the conditions which had brought the patient into the clinic originally. Most of the group of 25 initially treated with the 5 per cent sulfathiazole in iodized oil required from two to four irrigations of the nasal antrum before the infection cleared. Only 2 patients had antral returns containing pus after the fourth irrigation; they proved to have chronic maxillary sinusitis. Roentgenographically there was an improvement in the filling defect; a reduction in tissue thickness of 2 to 8 mm. was seen in the final roentgenogram as compared with the initial one. Not one in this group of 25 had complications involving the tracheobronchial or the pulmonary tree. The high incidence of improvement in the patients treated was probably due to early diagnosis and the establishment of drainage. The use of 5 per cent sulfathiazole in iodized oil described helped to lessen the subacute infection and thus prevented chronic inflammatory changes. The 2 patients who had chronic maxillary sinusitis showed no improvement roentgenographically since the filling defect did not vary; nor did they report clinical improvement. The interval between treatments had been the same for all patients—four treatments within three weeks.

These 2 patients who showed no improvement were then scheduled for irrigations with 5 per cent sodium sulfathiazole in saline solution every four days, preceded by saline lavage. They were added, as were 5 other patients carried over from other groups, to the 25 patients for whom the 5 per cent sodium sulfathiazole in saline solution was the initial irrigating solution. Usually 10 to 20 cc. of the solution was instilled at each treatment.

Clinically and roentgenographically the results were similar for 5 per cent sulfathiazole in iodized oil and for 5 per cent sodium sulfathiazole in saline solution. There was no response to treatment in cases of chronic purulent maxillary sinusitis secondary to allergy after use of either of the sulfathiazole solutions. The patients with chronic sinusitis did not improve even after two months of treatment; these treatments continuing beyond the usual three weeks for the patients whose sinusitis was chronic had been given one to three times per week. Five per cent sodium sulfathiazole in saline solution brought quicker relief to the patient and was immediately more soothing than 5 per cent sulfathiazole in iodized oil; with each solution, the same number of treatments were given although, as stated previously, without improvement of the chronic maxillary sinusitis secondary to allergy.

Roentgenographically the improvement in sinuses presenting acute and subacute conditions was similar for both of the 5 per cent solutions of sulfathiazole. In cases of chronic nonallergic sinusitis only, the response to treatment with 5 per cent sodium sulfathiazole in saline solution was better; fewer treatments were needed before the filling defect showed improvement. The number of irrigations, the antral return, the general improvement of the patient after the use of the two 5 per cent sulfathiazole solutions were not appreciably different from the same clinical signs in the group treated with isotonic solution of sodium chloride alone; the period of treatment was not shorter, nor did the course of infection vary greatly in any of the three groups as observed clinically and roentgenographically.

Penicillin in Saline Solution.—The next therapeutic agent to be considered is penicillin in saline solution; this was instilled into the antrum after saline lavage. The strength of the penicillin in the solution instilled every three or four days was 250 units, 500 units or 1,000 units per cubic centimeter. The patient treated with penicillin now included those who did not respond to isotonic solution of sodium chloride, those who did not respond to either of the sulfathiazole solutions and those who were receiving their initial irrigation (25 patients, according to the plan outlined). Five patients who had been carried over into the penicillin-treated group had bilateral sinusitis; in these patients one sinus was irrigated with saline and the other with penicillin solution.

Penicillin is known to be bacteriostatic and at times bactericidal; yet it proved no more effective than isotonic solution of sodium chloride as seen clinically or bacteriologically. Penicillin did not hasten improvement, nor were fewer treatments needed. The patient who had not improved on use of the other solutions did not improve under penicillin therapy. The strength of the penicillin used, whether 250 units, 500 units or 1,000 units per cubic centimeter, did not affect the sinusitis to any appreciable extent; the different strengths had been used on different patients, also on the same patients, at different times in the course of treatment.

Treatment of the 5 patients with bilateral sinusitis is here described. In each case, 2 of acute maxillary sinusitis and 3 of chronic maxillary sinusitis (nonallergic), the right antrum was irrigated with isotonic solution of sodium chloride and then filled with a saline solution of penicillin; the left antrum was merely irrigated with isotonic solution of sodium chloride. In a case of acute maxillary sinusitis, bilateral, the antrum treated with saline solution alone responded more quickly than the antrum treated with the penicillin solution, by one treatment. With each solution the end result was a clear antral return. The roentgenogram made with a contrast medium after treatment showed a greater decrease of the thickness of the sinal mucosa on the side treated with saline than on the side treated with penicillin solution.

Isotonic Solution of Sodium Chloride.—At this point the group of 25 patients who had received initial irrigation with isotonic solution of sodium chloride will be considered. Two treatments were given the first week, and one weekly thereafter—in all, four treatments within three weeks. Those patients who had acute or subacute maxillary sinusitis showed improvement both clinically and roentgenographically within two to four treatments; antral lavage produced a clear return and the conditions which had brought them to the clinic had improved. A comparison of the first and final roentgenograms showed a reduction of 2 to 8 mm. in the mucous membrane, with a corresponding increase in the filling defect.

Only 2 of the 25 patients in this group did not improve; they were then treated with one or all of the other solutions considered in this study; they proved to have chronic maxillary sinusitis of allergic type and did not improve on use of any other solution studied.

COMPARATIVE THERAPEUTIC VALUE OF ALL SOLUTIONS USED

In the 100 cases studied, all patients who had acute or subacute maxillary sinusitis responded equally well to all four solutions used; isotonic solution of sodium chloride, 5 per cent sulfathiazole in iodized oil, 5 per cent sodium sulfathiazole in saline solution and penicillin in saline solution. Since initial lavage with saline solution for exploratory purposes preceded every instillation of the solutions other than saline, the similar results may be attributed to the action of the saline solution alone. The important finding here is that neither the 5 per cent sulfathiazole solutions nor the penicillin solution had any unusual curative powers in the treatment of maxillary sinusitis. No solution had any appreciable effect on chronic purulent sinusitis of allergic origin. Of 8 patients with chronic maxillary sinusitis of a nonallergic type (among the 100 patients studied), 2 improved with the use of 5 per cent sodium sulfathiazole in saline solution, while 2 improved with the use of isotonic solution of sodium chloride alone; they had been treated with those two solutions initially and did not require further treatment with any other solution. The remaining patients with chronic sinusitis did not respond to any solution; surgical intervention was recommended since there was no resolution following seventeen irrigations over a period of three months.

The chronic maxillary sinusitis of allergic background did not respond to any concentration of penicillin, regardless of the frequency or the number of treatments, nor did such sinusitis improve with either of the 5 per cent sulfathiazole solutions, nor with the isotonic solution of sodium chloride. It is understood that conservative treatment cannot be continued indefinitely; surgical intervention is sometimes necessary in a case of chronic maxillary sinusitis. Penicillin did not seem to harm the mucous membrane of the accessory nasal sinuses, as demonstrated

by Bordley and associates,[9] nor did it seem effective in the treatment of patients in this study. Neither the duration nor the course of the infection was affected by the penicillin solution to any greater degree than by the saline solution alone.

In 3 cases of the series studied, the pyogenic organisms were reduced in number after penicillin was used; neither of the two sulfathiazole solutions, nor the saline solution, caused any such immediate reduction. Cultures of the antral return were sterile even after three days of incubation following the instillation of the penicillin solution and subsequent saline lavage; but the purulency of the antral return persisted, with no change in the quantity or the consistency of the secretion.

Abraham and Chain [10] found that penicillin is bacteriostatic and at times bactericidal; unlike other therapeutic agents, it is not a detergent; it is nonhemolytic; it is not affected by the presence of pus or by-products of the destruction of tissue, nor by large numbers of bacteria, nor by paraaminobenzoic acid.

Cook, Pool and Herrell [11] have proved that resistance to sulfonamide compounds does not indicate resistance to penicillin. Florey and co-workers [12] have summarized the advantages of penicillin over sulfonamide compounds; they found that while both have a bacteriostatic action, penicillin is stronger, is influenced only to a minor extent by the number of bacteria to be inhibited, is not hydrolyzed by hydrolytic protein products or pus and combines low toxicity to cells with powerful bacteriostatic action.

CASE RECORDS

Twenty-four case records, representing the subjective and the objective history of the patient, follow; statistics recorded at the beginning and at the end of treatment are given for each patient. There are records for four groups of 6 patients; each group was treated with one or another of the four solutions initially. The roentgenographic records of 3 cases (3, 16 and 22) are reproduced to illustrate the roentgenologic studies.

CASE 1.—Name: P. L. Age: 34.

Chief Complaint and Duration: Left frontal headache for the past two months, aggravated by flying.

9. Bordley, J. E.; Crowe, S. J.; Dolowitz, D. A., and Pickrell, K. L.: The Local Use of the Sulfonamides, Gramicidin (Tyrothricin) and Penicillin in Otolaryngology, Ann. Otol., Rhin. & Laryng. **51**:936-944 (Dec.) 1942.

10. Abraham, E. P., and Chain, E.: Purification and Some Physical and Chemical Properties of Penicillin, Brit. J. Exper. Path. **23**:103-115 (June) 1942.

11. Cook, E. N.; Pool, T. L., and Herrell, W. E.: Further Observations on Penicillin in Sulfonamide-Resistant Gonorrhea, Proc. Staff Meet., Mayo Clin. **18**: 433-437 (Nov. 17) 1943.

12. Abraham, E. P., and others: Further Observations on Penicillin, Lancet **2**:177-188 (Aug. 16) 1941.

History of Sinusitis: Frequent colds during the past eighteen months.

Transillumination: Right, clear; left, hazy.

Anterior Rhinoscopy: Right nasal vestibule, clear; left nasal vestibule, bloody mucoid discharge at anterior and inferior border of inferior turbinate.

Studies	Before Treatment	After Treatment
White blood cell count	11,000	7,000
Differential percentages:		
Polymorphonuclears	70	68
Lymphocytes	30	32
Sedimentation rate	40 mm. per hr.	10 mm. per hr.
Capacity of antrum:		
Right	10 cc.	12 cc.
Left	8 cc.	14 cc.

Exploratory Irrigation and Results: Discharge from both antrums, 4 plus, foul.

Culture Study: P. aeruginosa, 50 per cent; H. influenzae, 50 per cent.

Solution Used: 5 per cent sulfathiazole in iodized oil.

End Result: Sinusitis resolved in three weeks; four irrigations.

CASE 2.—Name: R. G. Age: 34.

Chief Complaint and Duration: Weakness, grip and vertigo for ten days prior to examination; temperature of 99 to 100 F. afternoons.

History of Sinusitis: Frequent colds in the past eighteen months.

Transillumination: Right, clear; left, hazy.

Anterior Rhinoscopy: Right nasal vestibule, pus in right middle meatus; left nasal vestibule, pus along floor.

Studies	Before Treatment	After Treatment
White blood cell count	9,000	7,000
Differential percentages:		
Polymorphonuclears	62	56
Lymphocytes	38	42
Monocytes	..	2
Sedimentation rate	44 mm. per hr.	6 mm. per hr.
Capacity of antrum:		
Right	12 cc.	20 cc.
Left	8 cc.	15 cc.

Exploratory Irrigation and Results: Discharge from both antrums, 4 plus; foul, copious.

Culture Study: P. aeruginosa, 90 per cent; alpha hemolytic streptococci, 10 per cent.

Solution Used: 5 per cent sulfathiazole in iodized oil.

End Result: Complete improvement within three weeks; four irrigations.

CASE 3.—Name: W. H. Age: 34.

Chief Complaint and Duration: Cold during previous two weeks with a post-nasal drip causing nausea.

History of Sinusitis: Frequent colds.

Transillumination: Right, cloudy; left, clear.

Anterior Rhinoscopy: Right nasal vestibule, clear; left nasal vestibule, clear.

Studies	Before Treatment	After Treatment
White blood cell count	11,800	6,200
Differential percentages:		
Polymorphonuclears	78	65
Lymphocytes	18	34
Monocytes	2	..
Eosinophils	2	1
Sedimentation rate	40 mm. per hr.	5 mm. per hr.
Capacity of antrum, right	10 cc.	20 cc.

Exploratory Irrigation and Results: Right return, 4 plus.

Culture Study: P. aeruginosa, 70 per cent; alpha hemolytic streptococci, 30 per cent.

Solution Used: 5 per cent sulfathiazole in iodized oil.

End Result: Cessation of nasal drip; return from antral lavage clear within three weeks; four irrigations.

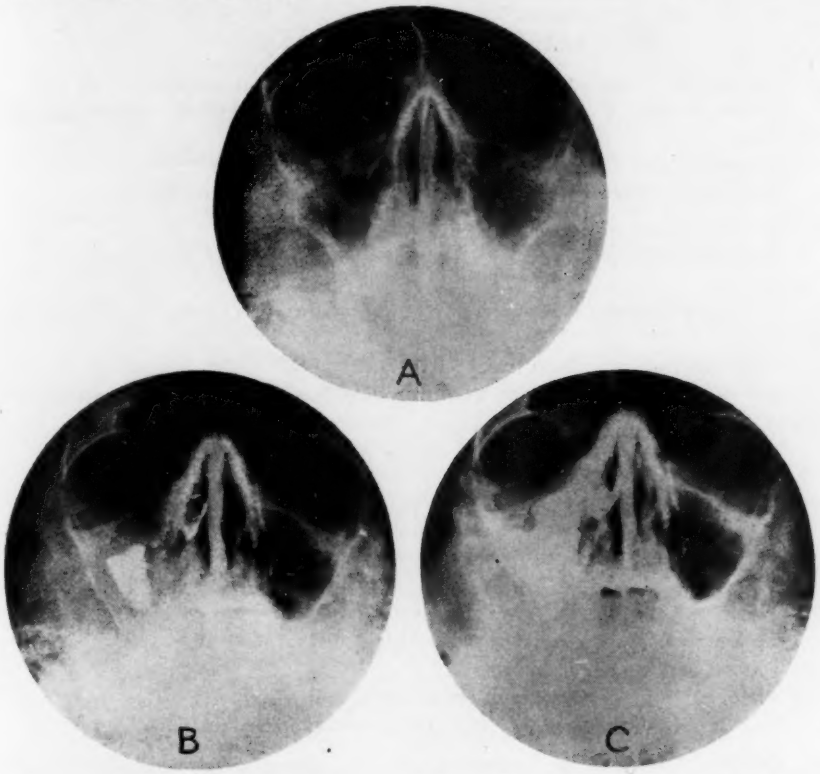

Fig. 1 (case 3).—*A*, roentgenogram made on Feb. 13, 1945, showing diffuse haziness over both maxillary sinuses.

B, roentgenogram made on the same day as *A* after a contrast medium had been instilled into the right maxillary sinus. Note the distance between the contrast medium and the wall of the sinus. It probably represents thickened membrane.

C, roentgenogram made on March 8 after iodized oil had been instilled into the right antrum, for comparison with *B*. It shows marked reduction in the distance between the border of the contrast medium and the wall of the sinus (from 6 mm. to about 3 mm. in the original roentgenogram, before reproduction, which is under the top limit of normal).

Case 4.—Name: A. T. Age: 46.

Chief Complaint and Duration: Bilateral otitis media; surgical incision to relieve pressure followed by persistent copious draining of the right ear for a week, while the left had ceased draining.

History of Sinusitis: Frequent colds.

Transillumination: Right, clear; left, clear.

Anterior Rhinoscopy: Right nasal vestibule, pus in middle meatus; left nasal vestibule, pus in posterior choana.

Studies	Before Treatment	After Treatment
White blood cell count	8,000	7,000
Differential percentages:		
Polymorphonuclears	52	65
Lymphocytes	47	34
Monocytes	1	1
Sedimentation rate	54 mm. per hr.	10 mm. per hr.
Capacity of antrum:		
Right	5 cc.	12 cc.
Left	7 cc.	15 cc.

Exploratory Irrigation and Results: 4 plus return bilaterally.

Culture Study: P. aeruginosa, 50 per cent; beta hemolytic streptococci, 50 per cent.

Solution Used: 5 per cent sulfathiazole in iodized oil.

End Result: Sinusitis resolved within three weeks; four irrigations.

Case 5.—Name: H. B. Age: 35.

Chief Complaint and Duration: Pain over right cheek for three days; cold for one week.

History of Sinusitis: Sinusitis twelve years ago; three colds per year on the average.

Transillumination: Right, clear; left, clear.

Anterior Rhinoscopy: Right nasal vestibule, heavy pus in middle meatus; left nasal vestibule, clear.

Studies	Before Treatment	After Treatment
White blood cell count	11,400	7,000
Differential percentages:		
Polymorphonuclears	75	68
Lymphocytes	25	32
Sedimentation rate	14 mm. per hr.	6 mm. per hr.
Capacity of antrum:		
Right	4 cc.	12 cc.
Left	6 cc.	15 cc.

Exploratory Irrigation and Results: Right discharge, 4 plus.

Culture Study: P. aeruginosa.

Solution Used: 5 per cent sulfathiazole in iodized oil.

End Result: Sinusitis resolved in three weeks; four irrigations.

Case 6.—Name: R. M. Age: 43.

Chief Complaint and Duration: Nesopharyngitis in the past two weeks, which did not respond to the usual treatment.

History of Sinusitis: None.

Transillumination: Right, clear; left, hazy.

Anterior Rhinoscopy: Right nasal vestibule, clear; left nasal vestibule, clear.

Studies	Before Treatment	After Treatment
White blood cell count	8,200	7,000
Differential percentages:		
Polymorphonuclears	56	67
Lymphocytes	42	31
Monocytes	2	..
Basophils	..	2
Sedimentation rate	30 mm. per hr.	10 mm. per hr.
Capacity of antrum, left	12 cc.	20 cc.

Exploratory Irrigation and Results: Left return, 4 plus.

Culture Study: P. aeruginosa, 95 per cent; Proteus, species not determined, 5 per cent.

Solution Used: 5 per cent sulfathiazole in iodized oil.

End Result: Sinusitis resolved within three weeks; four irrigations.

CASE 7.—Name: R. W. Age: 35.

Chief Complaint and Duration: Supraorbital discomfort for three days.

History of Sinusitis: None.

Transillumination: Right, clear; left, clear.

Anterior Rhinoscopy: Right nasal vestibule, clear; left nasal vestibule, suspicion of pus in middle meatus.

Studies	Before Treatment	After Treatment
White blood cell count	12,500	10,000
Differential percentages:		
Polymorphonuclears	74	67
Lymphocytes	25	33
Eosinophils	1	
Sedimentation rate	44 mm. per hr.	11 mm. per hr.
Capacity of antrum, left	4 cc.	16 cc.

Exploratory Irrigation and Results: Left return, 4 plus.

Culture Study: A few colonies each of the following organisms: Staph. albus, small gram-negative bacillus, probably H. influenzae.

Solution Used: 5 per cent sodium sulfathiazole in saline solution.

End Result: Clear antral return within three weeks; four irrigations.

CASE 8.—Name: H. S. Age: 34.

Chief Complaint and Duration: Nonresolving cold for eight days, with medical care.

History of Sinusitis: None.

Transillumination: Right, hazy; left, clear.

Anterior Rhinoscopy: Right nasal vestibule, pus between septum and inferior turbinate; left nasal vestibule, clear.

Studies	Before Treatment	After Treatment
White blood cell count	9,200	10,000
Differential percentages:		
Polymorphonuclears	60	70
Lymphocytes	39	30
Monocytes	1	
Sedimentation rate	44 mm. per hr.	9 mm. per hr.
Capacity of antrum, right	7 cc.	12 cc.

Exploratory Irrigation and Results: Right return, 4 plus.

Culture Study: Alpha hemolytic streptococci.

Solution Used: 5 per cent sodium sulfathiazole in saline solution.

End Result: Sinusitis resolved within three weeks; four irrigations.

CASE 9.—Name: M. D. Age: 36.

Chief Complaint and Duration: Increased drainage posteriorly; a cold two weeks previously.

History of Sinusitis: Frequent colds; no improvement following the use of nose drops.

Transillumination: Right, hazy; left, clear.

Anterior Rhinoscopy: Right nasal vestibule, clear; left nasal vestibule, clear.

Studies	Before Treatment	After Treatment
White blood cell count	19,700	14,000
Differential percentages:		
Polymorphonuclears	79	72
Lymphocytes	21	27
Monocytes	..	1
Sedimentation rate	23 mm. per hr.	12 mm. per hr.
Capacity of antrum:		
Right	4 cc.	10 cc.
Left	8 cc.	20 cc.

Exploratory Irrigation and Results: Right and left returns, 4 plus.

Culture Study: Nonpathogenic Neisseria, species not determined, 60 per cent; nonhemolytic streptococci, 30 per cent; P. aeruginosa, 10 per cent.

Solution Used: 5 per cent sulfathiazole in iodized oil; 5 per cent sodium sulfathiazole in saline solution.

End Result: Antral lavage clear after five weeks of treatment. Three weeks on 5 per cent sulfathiazole in iodized oil; four irrigations. Two weeks on 5 per cent sodium sulfathiazole in saline solution; three irrigations.

CASE 10.—Name: C. W. Age: 44.

Chief Complaint and Duration: Continuing cough and cold for past two weeks.

History of Sinusitis: None.

Transillumination: Right, clear; left, hazy.

Anterior Rhinoscopy: Right nasal vestibule, clear, left nasal vestibule, clear.

Studies	Before Treatment	After Treatment
White blood cell count	Not obtained	8,750
Differential percentages:		
Polymorphonuclears	Not obtained	76
Lymphocytes	..	24
Sedimentation rate	24 mm. per hr.	17 mm. per hr.
Capacity of antrum, left	5 cc.	10 cc.

Exploratory Irrigation and Results: Left return, 4 plus.

Culture Study: Staph. aureus, 99 per cent; Staph. albus, 1 per cent.

Solution Used: 5 per cent sodium sulfathiazole in saline solution.

End Result: Clear antral return within three weeks; three irrigations.

CASE 11.—Name: D. M. Age: 34.

Chief Complaint and Duration: Pain in left cheek for one day; cough for seven days.

History of Sinusitis: None.

Transillumination: Right, clear; left, clear.

Anterior Rhinoscopy: Right nasal vestibule, mucopurulent secretion at posterior third of inferior turbinate; left nasal vestibule, clear.

Studies	Before Treatment	After Treatment
White blood cell count	12,000	10,000
Differential percentages:		
Polymorphonuclears	52	66
Lymphocytes	48	33
Monocytes	..	1
Sedimentation rate	11 mm. per hr.	8 mm. per hr.
Capacity of antrum, right	6 cc.	20 cc.

Exploratory Irrigation and Results: Right return, 4 plus.

Culture Study: Cultures sterile after three days' incubation.

Solution Used: 5 per cent sodium sulfathiazole in saline solution.

End Result: Sinusitis resolved within three weeks; three irrigations.

CASE 12.—Name: E. B. Age: 32.

Chief Complaint and Duration: Fulness in the right ear for the past ten days.

History of Sinusitis: None.

Transillumination: Right, clear; left, clear.

Anterior Rhinoscopy: Right nasal vestibule, pus along floor of nasal vestibule; left nasal vestibule, clear.

Studies	Before Treatment	After Treatment
White blood cell count	13,900	8,700
Differential percentages:		
Polymorphonuclears	71	60
Lymphocytes	29	39
Eosinophils	..	1
Sedimentation rate	25 mm. per hr.	11 mm. per hr.
Capacity of antrum, right	10 cc.	16 cc.

Exploratory Irrigation and Results: Right return, 4 plus.

Culture Study: Gram-negative bacillus, not identified, 75 per cent; alpha hemolytic streptococci, 15 per cent.

Solution Used: 5 per cent sodium sulfathiazole in saline solution.

End Result: Clear antral return within two weeks; three irrigations.

CASE 13.—Name: J. J. Age: 34.

Chief Complaint and Duration: Head cold for a week; pain in left cheek.

History of Sinusitis: Left maxillary sinusitis last year.

Transillumination: Right, clear; left, hazy.

Anterior Rhinoscopy: Right nasal vestibule, clear; left nasal vestibule, pus at the anterior tip of middle and inferior turbinate.

Studies	Before Treatment	After Treatment
White blood cell count	8,000	8,000
Differential percentages:		
Lymphocytes	40	29
Polymorphonuclears	59	69
Eosinophils	1	1
Monocytes	..	1
Sedimentation rate	23 mm. per hr.	10 mm. per hr.
Capacity of antrum, left	7 cc.	18 cc.

Exploratory Irrigation and Results: Left return, 4 plus.

Culture Study: Staph. albus.

Solution Used: Isotonic solution of sodium chloride.

End Result: Sinusitis resolved within two weeks; three irrigations.

CASE 14.—Name: W. R. Age: 25.

Chief Complaint and Duration: Pain over right cheek and a cold last week.

History of Sinusitis: None.

Transillumination: Right, cloudy; left, clear.

Anterior Rhinoscopy: Right nasal vestibule, pus over the posterior third of the inferior turbinate; left, clear.

Studies	Before Treatment	After Treatment
White blood cell count	10,000	7,759
Differential percentages:		
Polymorphonuclears	68	72
Lymphocytes	31	28
Monocytes	1	
Sedimentation rate	32 mm. per hr.	11 mm. per hr.
Capacity of antrum, right	5 cc.	15 cc.

Exploratory Irrigation and Results: Right return, 4 plus.

Culture Study: E. coli, 85 per cent; alpha hemolytic streptococci, 10 per cent; Staph. albus.

Solution Used: Isotonic solution of sodium chloride.

End Result: Sinusitis resolved within three weeks; four irrigations.

CASE 15.—Name: F. B. Age: 30.

Chief Complaint and Duration: Pain in right cheek for three days.

History of Sinusitis: None.

Transillumination: Right, hazy; left, clear.

Anterior Rhinoscopy: Right nasal vestibule, clear; left nasal vestibule, clear.

Studies	Before Treatment	After Treatment
White blood cell count	12,500	
Differential percentages:		
Polymorphonuclears	70	
Lymphocytes	30	
Sedimentation rate	25 mm. per hr.	6 mm. per hr.
Capacity of antrum, right	7 cc.	20 cc.

Exploratory Irrigation and Results: Right, 4 plus.

Culture Study: Alpha hemolytic streptococci, 90 per cent; diphtheroids, 5 per cent; occasional colonies of P. aeruginosa and of an unidentified gram-negative bacillus.

Solution Used: 5 per cent sulfathiazole in iodized oil.

End Result: Improvement within three weeks; four injections.

CASE 16.—Name: S. M. Age: 40

Chief Complaint and Duration: Supraorbital headache with generalized weakness for past week.

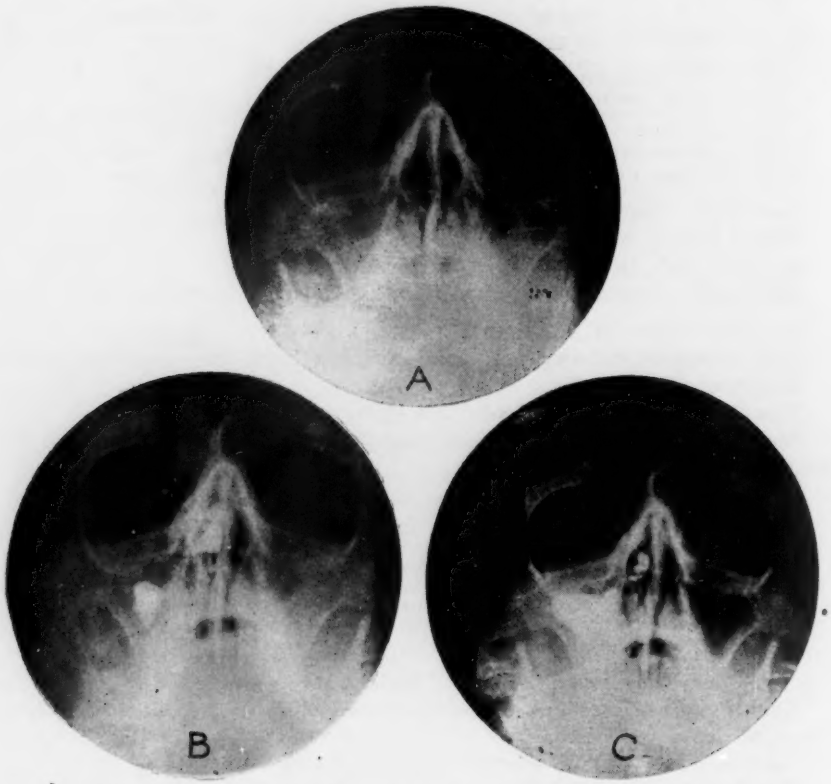

Fig. 2 (case 16).—*A*, roentgenogram made on March 1, 1945, showing both maxillary sinuses cloudy.

B, roentgenogram made on same date as *A* after a contrast medium had been instilled into the right antrum. Note that there is only a small collection. In the original roentgenogram a distance of about 7 mm. intervenes between the margin of the contrast medium and the wall of the sinus.

C, roentgenogram made on March 15 after a contrast medium had been instilled in the right antrum, for comparison with *B*. The distance between the margin of the contrast medium and the wall of the sinus is shown reduced (from 7 mm. to about 5 mm. in the original).

History of Sinusitis: None within the last year.

Transillumination: Right, hazy; left, clear.

Anterior Rhinoscopy: Right nasal vestibule, clear; left nasal vestibule, clear.

Studies	Before Treatment	After Treatment
White blood cell count	7,200	5,250
Differential percentages:		
Polymorphonuclears	61	69
Lymphocytes	38	31
Eosinophils	1	
Sedimentation rate	29 mm. per hr.	10 mm. per hr.
Capacity of antrum, right	7 cc.	15 cc.

Exploratory Irrigation and Results: Right return, 4 plus.

Culture Study: Staph. aureus, 85 per cent.; alpha hemolytic streptococci, 15 per cent

Solution Used: Isotonic solution of sodium chloride.

End Result: Antral return clear within three weeks; four irrigations.

CASE 17.—Name: E. B. Age: 34.

Chief Complaint and Duration: Cold for past week; pain in right cheek.

History of Sinusitis: None.

Transillumination: Right, hazy; left, clear.

Anterior Rhinoscopy: Right nasal vestibule, clear; left nasal vestibule, clear.

Studies	Before Treatment	After Treatment
White blood cell count	8,900	7,200
Differential percentages:		
Polymorphonuclears	62	64
Lymphocytes	38	35
Sedimentation rate	15 mm. per hr.	2 mm. per hr.
Capacity of antrum, right	3 cc.	17 cc.

Exploratory Irrigation and Results: Right return, 4 plus.

Culture Study: A. aerogenes.

Solution Used: Isotonic solution of sodium chloride.

End Result: Sinusitis resolved within two weeks; two irrigations.

CASE 18.—Name: D. R. Age: 37.

Chief Complaint and Duration: Supraorbital pain on right side with prolonged nasal congestion.

History of Sinusitis: None.

Transillumination: Right, cloudy; left, clear.

Anterior Rhinoscopy: Right nasal vestibule, clear; left nasal vestibule, clear.

Studies	Before Treatment	After Treatment
White blood cell count	15,100	9,700
Differential percentages:		
Polymorphonuclears	75	69
Lymphocytes	25	31
Sedimentation rate	22 mm. per hr.	5 mm. per hr.
Capacity of antrum, right	5 cc.	17 cc.

Exploratory Irrigation and Results: Right return, 4 plus.

Culture Study: Alpha hemolytic streptococci, 90 per cent; Staph. albus, 7 per cent; Staph. aureus, 3 per cent.

Solution Used: Isotonic solution of sodium chloride.

End Result: Condition improved within two weeks; three irrigations.

CASE 19.—Name: C. L. Age: 33.

Chief Complaint and Duration: Sore throat for past week; tonsillectomy two weeks before.

History of Sinusitis: Sinusitis for the last five years.

Transillumination: Right, clear; left, cloudy.

Anterior Rhinoscopy: Right nasal vestibule, clear; left nasal vestibule, purulent discharge along the floor and along the postlaryngeal fold.

Studies	Before Treatment	After Treatment
White blood cell count	9,900	8,000
Differential percentages:		
Polymorphonuclears	71	58
Lymphocytes	28	40
Eosinophils	1	1
Basophils	..	1
Sedimentation rate	35 mm. per hr.	5 mm. per hr.
Capacity of antrum, left	4 cc.	15 cc.

Exploratory Irrigation and Results: Left return, 4 plus; right return, clear.

Culture Study: Alpha hemolytic streptococci.

Solution Used: 5 per cent sulfathiazole in iodized oil; 5 per cent sodium sulfathiazole in saline solution; penicillin in saline solution (250 units per cubic centimeter).

End Results: Sinusitis unresolved after ten weeks of treatments, 17 in number: isotonic solution of sodium chloride, four irrigations; 5 per cent sulfathiazole in iodized oil and 5 per cent sodium sulfathiazole in saline solution, four each; penicillin in saline solution, five irrigations.

CASE 20.—Name: R. O. Age: 37.

Chief Complaint and Duration: In past week patient felt tired and cold; in past month had had fever and toxic symptoms.

History of Sinusitis: None.

Transillumination: Right, hazy; left, hazy.

Anterior Rhinoscopy: Right nasal vestibule, clear; left nasal vestibule, purulent secretion over edge of inferior turbinate.

Studies	Before Treatment	After Treatment
White blood cell count	14,000	9,500
Differential percentages:		
Polymorphonuclears	71	68
Lymphocytes	29	32
Eosinophils		
Monocytes		
Sedimentation rate	50 mm. per hr.	14 mm. per hr.
Capacity of antrum:		
Right	5 cc.	20 cc.
Left	6 cc.	20 cc.

Exploratory Irrigation and Results: Right and left returns, 4 plus.

Culture Study: Staph. albus.

Solution Used: Penicillin in saline solution (1,000 units per cubic centimeter).

End Result: Sinusitis resolved within three weeks; four irrigations.

CASE 21.—Name: G. D. Age: 36.

Chief Complaint and Duration: Cold for two weeks; breathing seemed blocked.

History of Sinusitis: None.

Transillumination: Right, clear; left, clear.

Anterior Rhinoscopy: Right nasal vestibule, pus in right middle meatus; left nasal vestibule, clear.

Studies	Before Treatment	After Treatment
White blood cell count	12,240	8,600
Differential percentages:		
Polymorphonuclears	73	71
Lymphocytes	27	26
Monocytes	..	2
Eosinophils	..	1
Sedimentation rate	30 mm. per hr.	11 mm. per hr.
Capacity of antrum, right	5 cc.	25 cc.

Exploratory Irrigation and Results: Right return, 3 plus.

Culture Study: H. influenzae, 95 per cent; Staph. albus, 5 per cent.

Solution Used: Penicillin in saline solution (500 units per cubic centimeter).

End Result: Sinusitis resolved within three weeks; four irrigations.

CASE 22.—Name: M. M. Age: 41.

Chief Complaint and Duration: Cold for two weeks.

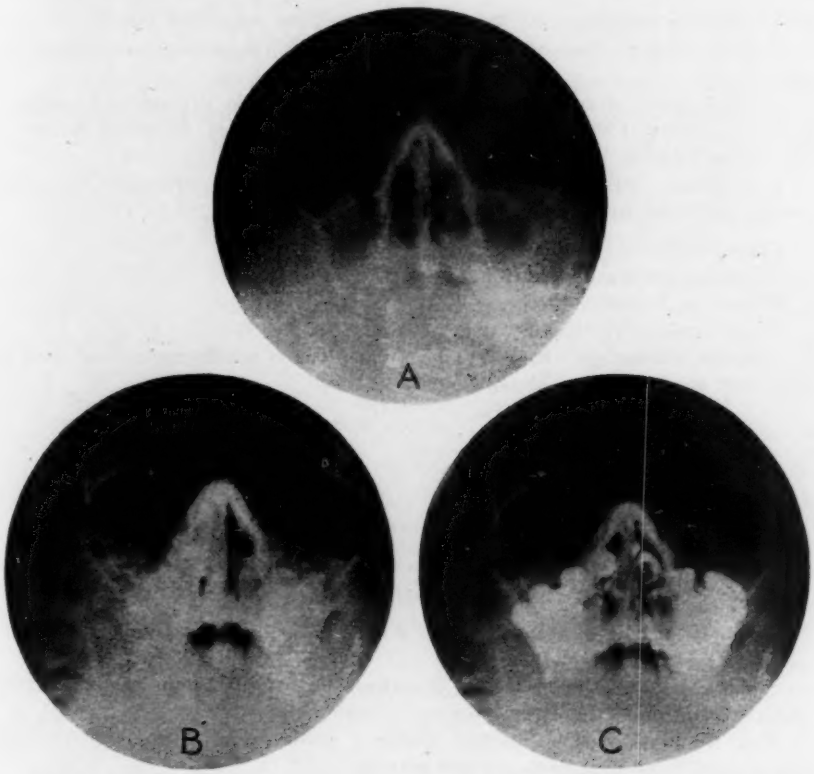

Fig. 3 (case 22).—*A*, roentgenogram made on March 28, 1945, showing diffuse haziness over both maxillary sinuses.

B, roentgenogram made on the same day as *A* after a contrast medium had been instilled into both antrums. Note the distance between the margin of the contrast medium and the wall of the sinus (in the original the distance averages about 8 mm. on the left and about 4 mm. on the right side). This interval probably represents thickened membranes.

C, roentgenogram made on April 19 after instillation of the contrast medium, for comparison with *B*. The average distance between the margin of the contrast medium and the wall of the sinus on each side is now reduced (in the original, to about 2 mm., which is within normal limits).

History of Sinusitis: None.

Transillumination: Right, hazy; left, hazy.

Anterior Rhinoscopy: Right nasal vestibule, clear; left nasal vestibule, clear.

Studies	Before Treatment	After Treatment
White blood cell count	10,000	7,220
Differential percentages:		
Polymorphonuclears	69	72
Lymphocytes	28	31
Eosinophils	1	
Monocytes	2	
Sedimentation rate	24 mm. per hr.	10 mm. per hr.
Capacity of antrum:		
Right	6 cc.	18 cc.
Left	6 cc.	7 cc.

Exploratory Irrigation and Results: Right and left returns, 4 plus.

Culture Study: Predominating alpha hemolytic streptococci; occasional A. aerogenes.

Solution Used: Isotonic solution of sodium chloride in left antrum; penicillin in saline solution (500 units per cubic centimeter) instilled, following irrigation with saline solution, in right antrum.

End Result: Sinusitis resolved after two weeks; two irrigations for right antrum and three irrigations for left antrum.

Case 23.—Name: F. E. Age: 32.

Chief Complaint and Duration: Cold for two weeks.

History of Sinusitis: None.

Transillumination: Right, cloudy; left, clear.

Anterior Rhinoscopy: Right nasal vestibule, pus in middle meatus and floor of nose; left nasal vestibule, clear.

Studies	Before Treatment	After Treatment
White blood cell count	10,000	7,220
Differential percentages:		
Polymorphonuclears	65	Not taken
Lymphocytes	34	
Monocytes	1	
Sedimentation rate	50 mm. per hr.	10 mm. per hr.
Capacity of antrum:		
Right	4 cc.	13 cc.
Left	6 cc.	17 cc.

Exploratory Irrigation and Results: Right and left returns, 4 plus.

Culture Study: Staph. albus.

Solution Used: Right, penicillin in saline solution (1,000 units per cubic centimeter); left, isotonic solution of sodium chloride.

End Result: Sinusitis resolved within 2 weeks; four irrigations for right antrum and three irrigations for left antrum.

Case 24.—Name: V. S. Age: 36.

Chief Complaint and Duration: Supraorbital pain for three days, following grip of ten days' duration.

History of Sinusitis: None.

Transillumination: Right, hazy; left, hazy.

Anterior Rhinoscopy: Right nasal vestibule, pus seen on floor; left nasal vestibule, pus in middle meatus.

Studies	Before Treatment	After Treatment
White blood cell count	8,000	5,950
Differential percentages:		
Polymorphonuclears	58	68
Lymphocytes	41	32
Monocytes	1	
Sedimentation rate	40 mm. per hr.	11 mm. per hr.
Capacity of antrum:		
Right	7 cc.	15 cc.
Left	9 cc.	15 cc.

Exploratory Irrigation and Results: Right and left returns, 4 plus.
Culture Study: Alpha hemolytic streptococci.
Solution Used: Penicillin in saline solution (500 units per cubic centimeter) in left antrum; isotonic solution of sodium chloride in right antrum.
End Result: Sinusitis resolved within three weeks; four irrigations.

SUMMARY AND CONCLUSIONS

One hundred patients were the basis of a study for evaluating the methods of diagnosing maxillary sinusitis; a comparison of the therapeutic value of several solutions now in use for irrigating the sinuses was also made. The patients were divided at random into four groups of 25. These groups were treated initially with these four solutions, respectively: isotonic solution of sodium chloride; 5 per cent sulfathiazole in iodized oil; 5 per cent sodium sulfathiazole in saline solution; penicillin in saline solution in strengths of 250, 500 and 1,000 units per cubic centimeter. Roentgenograms were made as follows: at the first visit, a flat plate and one with a contrast medium; at the end of treatment, a third plate with a contrast medium. Any patient who did not respond to one solution was carried over into another group and treated with that group; this was repeated with the remaining solutions unless there was some response.

A history of recurrent or persistent head colds was given by the majority of patients. The patients did not always give a typical history suggestive of maxillary sinusitis. Objective methods which were evaluated were: anterior rhinoscopy, transillumination, roentgenography and exploratory irrigation. The erythrocyte sedimentation rate, the white blood cell count and the differential count were recorded for each patient both at the beginning and at the end of treatment. A vasoconstrictor, ephedrine 1 per cent in saline solution, was given for home use.

Anterior rhinoscopy revealed the presence or the absence of pus. In 72 per cent of the cases studied, pus in the middle meatus, along the middle third or the posterior third of the inferior turbinate, indicated that pus was present in the antrum.

Transillumination did not prove an accurate diagnostic confirmatory finding; in 29 per cent of the cases transillumination was cloudy to hazy (positive), while the antral return was clear (negative). In another 29 per cent transillumination was clear (negative), while the antral return was filled with purulent secretion (positive). In the remaining 42 per cent transillumination graded hazy to cloudy (positive) was confirmed by the antral return following irrigation.

The roentgenographic readings were confirmed in 86 per cent of the cases.

If any one of the diagnostic methods indicated maxillary sinusitis, exploratory irrigation with isotonic solution of sodium chloride followed. In one group the treatment with the saline solution was continued; in the other three groups the irrigation with the saline solution merely preceded

the use of 5 per cent sulfathiazole in iodized oil or 5 per cent sodium sulfathiazole in saline solution or penicillin in saline solution. The antral capacity was found to range from 3 cc. during inflammation to 35 cc. when the inflammation had subsided. The capacity of the antrum proved to be an important factor in diagnosis. In 75 per cent of the cases irrigation was done through the natural or an accessory ostium; a puncture of the nasoantral wall in the inferior meatus was made when the middle meatus was not visible or accessible.

The erythrocyte sedimentation rate was high for all patients at the beginning of treatment, with a range of 18 to 50 mm. per hour. It decreased to normal as the patients improved. There was correlation between the sedimentation rate and the state of the antral return; a purulent return in a state of suspension was associated with a high rate. There was, also, correlation between the decrease in the sedimentation rate and the improvement in the filling defect as seen roentgenographically; the mucosal thickness as estimated by roentgenogram decreased by as much as 2 to 8 mm.

Bacteriologic studies of the antral return from the maxillary sinus were made to determine the therapeutic agent which might be effective against the organism found therein. A nonbactericidal and nonbacteriostatic agent such as isotonic solution of sodium chloride, used locally, proved just as effective in bringing about resolution of the sinusitis as did the sulfathiazole and penicillin solutions, also used locally. The latter solutions are both bacteriostatic; the penicillin is sometimes bactericidal. Those patients who had maxillary sinusitis of the acute or subacute type improved within two to four treatments with any of the four solutions in use; early diagnosis and establishment of drainage may have hastened recovery. The 5 per cent sodium sulfathiazole in saline solution brought quicker relief to the patient than the 5 per cent sulfathiazole in iodized oil. Chronic maxillary sinusitis secondary to allergy showed no improvement with any solution; chronic sinusitis of nonallergic type showed earlier improvement with the 5 per cent sodium sulfathiazole in saline solution than with the 5 per cent sulfathiazole in iodized oil. The 5 per cent sodium sulfathiazole in saline solution as well as the penicillin (used in different strengths and on the same patients as the isotonic solution of sodium chloride) was no more effective than the saline solution. Surgical intervention was recommended where there was no resolution with any of the solutions after as many as twenty-four to thirty antral lavages. Penicillin did affect the pyogenic organisms susceptible to the drug, after the third or fourth irrigation; cultures of the antral return were sterile even after three days of incubation; in cases of chronic maxillary sinusitis the purulency still persisted, however. Neither the sulfathiazole nor the penicillin in solutions proved to be of the value one might have anticipated in the local treatment of maxillary sinusitis.

2025 Eye Street, Northwest.

LARYNGEAL CHONDROMA

RAYMOND S. ROSEDALE, M.D.
CANTON, OHIO

AMONG the unusual tumors of the larynx, the chondroma is especially rare. Most textbooks do not mention it. The fact of its unusual occurrence justifies the presentation of the case which I have observed.

Moore,[1] in 1925, published a comprehensive review of the 62 previously reported cases. Any one especially interested in this subject should read his three papers. He mentioned that the first case to be reported was that of Hensinger, in 1822.

In 1918 New [2] stated that the occurrence of a cartilaginous tumor of the larynx was rare and that he had found 38 cases in the literature. He added 8 additional reported cases. These plus 1 case of his own made a total of 47 cases.

Other case reports, some with reviews of the literature, have been contributed by Figi,[3] in 1932, Graham,[4] in 1934, Hennessy,[5] in 1935, Murdock and Neuffer,[6] in 1940 and Holinger and Matzkin,[7] in 1942. Figi [3] stated that he examined 600 malignant neoplasms of the larynx at the Mayo Clinic and found only 6 which could be classified as chondroma in the same period. He reported that at the time of the writing of his paper his cases plus the recorded ones made a total of 77. In 1942 Gatewood [8] reported 2 cases in which laryngofissure was employed and wrote that the total number of cases to that time, including his own, was 83.

---

1. Moore, I.: Cartilaginous Tumors of the Larynx: A Study of All the Recorded Cases, J. Laryng. & Otol. **40**:9-14 (Jan.); 84-109 (Feb.); 145-164 (March) 1925.

2. New G. B.: Cartilaginous Tumors of the Larynx,. Laryngoscope **28**:367 (May 18) 1918.

3. Figi, F. A.: Chondroma of the Larynx: Report of Six Cases, Ann. Otol., Rhin. & Laryng. **41**:369-386 (June) 1932.

4. Graham, H. B.: Chondroma of Larynx: Case Report, Ann. Otol., Rhin. & Laryng. **43**:209-303 (March) 1934.

5. Hennessy, R.: A Chondroma of the Larynx, J. Laryng. & Otol. **50**:688-689 (Sept.) 1935.

6. Murdock, E., and Neuffer, F.: Chondroma of the Larynx Requiring Total Laryngectomy, South. M. J. **33**:274-278 (March) 1940.

7. Holinger, P. H., and Matzkin, L. L.: Chondroma of the Larynx, Arch. Otolaryng. **35**:640-645 (April) 1942.

8. Gatewood, E. T.: Chondroma of the Larynx: Report of Two Cases in Which Laryngofissure Was Employed, Arch. Otolaryng. **36**:187-197 (Aug.) 1942.

The entity has been reported by others also, but for the sake of brevity the entire literature will not be reviewed.

PATHOLOGIC ASPECTS

Chondromas in general are rather common. They are benign tumors of mesodermal origin with the histologic characteristics of hyaline cartilage. They may occur throughout the skeletal system. Sometimes they are multiple. They rarely attain large proportions. However, because cartilage is lymph nourished, chondromas can thrive and attain a relatively large size in areas which normally would be considered to have a precarious or insufficient blood supply. This is in contradistinction to almost all other benign tumors of the connective tissue group. It is because of this characteristic that one may find chondromas flourishing in situations such as joints and in natural channels and spaces in which other tumors of connective tissue origin could not ordinarily attain such dimensions.

Chondromas are of firm consistency and usually bluish gray. They are most often rounded, although in certain locations they may be ovoid or flattened. When one arises from an anatomic cartilaginous site, it does not possess a true fibrous capsule in relation to its origin. The soft tissues are pushed aside or forward by the growth, thus offering a partial plane of cleavage. However, this plane does not extend between the tumor and its site of origin. It is for this reason that such a tumor cannot be "shelled out" as in the case of almost all other simple benign tumors. Therefore, the surgeon must remove it by morcellement or with the scalpel. Because of the slow expansile growth of chondromas, there is apt to be pressure atrophy of the contiguous tissues, and in the case of chondroma of the larynx or the trachea, therefore, it may be impossible to remove the tumor without damaging the greatly thinned structures lining these organs.

In general, chondromas are relatively free from degenerative changes. Calcific deposits are found, but not more frequently than in normal cartilage with advance in years. Amyloid may be deposited in chondromas. Blood vessels are not found in sections of chondromas. Neither are lymph vessels seen, because, as already mentioned, cartilage is lymph nourished by the process of osmosis. Histologically, there is no difference between chondroma of the larynx and those of other parts of the body. The matrix consists of a reticulate amorphous background in which cartilage cells are found. These are characterized by clear or vacuolated ovoid and rounded areas, containing dark blue–staining, ovoid or stellate nuclei. In most of the cases of chondroma of the larynx the growth has arisen from the posterior aspect of the anterior arch of the cricoid cartilage.

Ewing[9] used the term "ecchondrosis" to distinguish a limited outgrowth arising from preexisting cartilage and stated that it represents simple hyperplasia. In contradistinction, he applied the term "chondroma" to cartilaginous neoplasms arising from similar locations as well as from areas which do not ordinarily contain cartilage. He stated that in some instances a large chondroma can arise from an ecchondrosis.

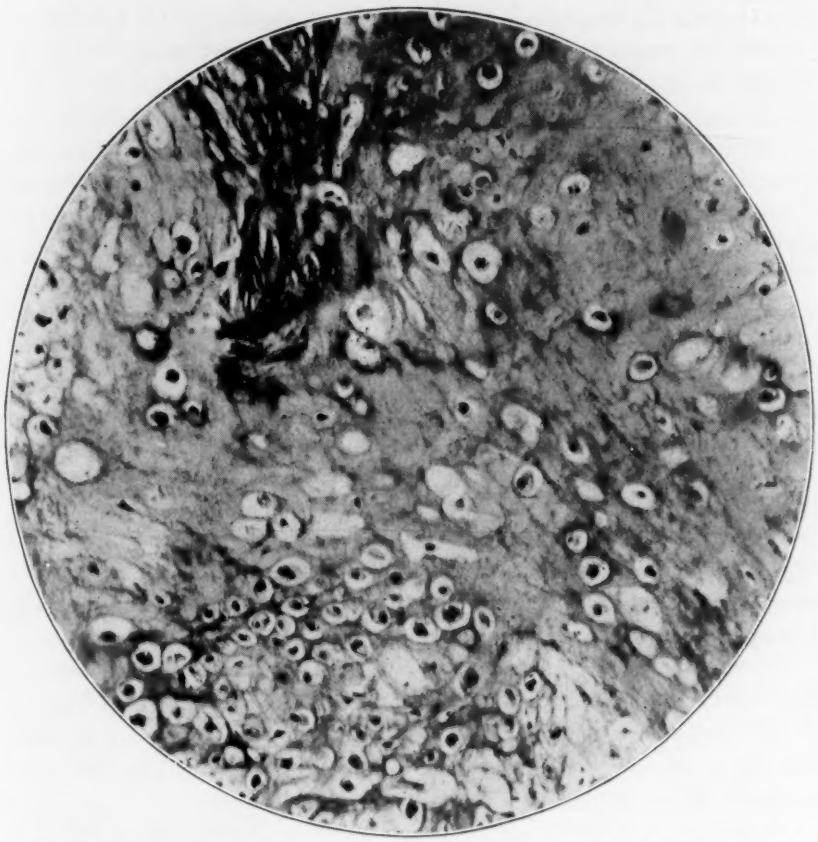

Fig. 1.—Photomicrograph of a characteristic area of the chondroma of the larynx. There is some degeneration.

The line of distinction is not clear except when the lesion can be found to possess a preponderance of tumor characteristics, rather than those of hyperplasia.

SYMPTOMS AND DIAGNOSIS

The symptom complex of laryngeal chondroma is not specific. The general symptoms of malignant tumors, such as loss of weight, strength and appetite, and those of metastases are absent. The symptoms, natu-

9. Ewing, J.: Neoplastic Diseases: A Treatise on Tumors, ed. 4, Philadelphia, W. B. Saunders Company, 1940, p. 264.

rally, are those of a "muting" or tamponading tumor of the larynx, namely, impairment of the voice, followed by obstructive dyspnea and, with increasing bulk of the tumor, possibly dysphagia. Any factor which may cause a sudden increase of the bulk of the intraglottic soft tissues, such as acute inflammation or allergic swelling, will, of course, cause exacerbation of these symptoms.

In cases in which the tumor bulk is confined to the inner skeletal outlines of the larynx, no mass will be found in the neck. In other cases, in which the tumor has extruded itself, a firm or hard smooth ovoid or rounded nodule will be palpable in the neck, contiguous with one of the skeletal arches of the larynx. Movement of the skeleton of the larynx will cause movement of the mass in the neck. Such masses are not subject to variations in size with cycles of inflammatory or allergic swelling as are the intrinsic glottic masses. The peripheral lymph nodes will not be enlarged.

In examination of the glottis one will see a rounded smooth sessile pale gray or white mass presenting in the lumen. Since the mucosa has been thinned by pressure atrophy, its vascularization is apt to appear pronounced, so that one may see several contrasting reddish, well defined vessels coursing over the mass. Ulceration of chondroma has not been reported. By virtue of the nature of the tumor, it should feel quite firm, perhaps being, at least, of the firmness of cork. When a mass is palpable in the neck, it should move with movement of the larynx, and conversely ballottement of the cervical mass should cause the intraglottic mass to change its position. Free mobility of the mass and its pallor and firm texture are almost diagnostic to the examiner who is familiar with gross pathologic characteristics of this tumor.

Review of the literature (page 1) indicates that in the majority of the cases the tumor occurs in males, in the fourth, fifth and sixth decades.

The immediate diagnosis depends on the history of a slowly progressive lesion causing hoarseness and dyspnea, accompanied by the gross characteristics indicated in a foregoing paragraph.

TREATMENT

The treatment of chondroma of the larynx may be considered in two phases. If the tumor is recognized before laryngeal obstruction occurs, it may be removed through the endolaryngeal route, provided it is not of large size. If its size precludes endolaryngeal removal, thyrofissure should be performed.

When the patient is seen with glottic obstruction, which the literature indicates is not unusual, the functional integrity of the airway, must be restored, and this, because of the unyielding nature of the tumor mass, should be done by tracheotomy. The tumor may be removed by morcellement, or, if a plane of cleavage can be found, it may be stripped from its

bed by thin elevators such as are used in submucous resection of the nasal septum. If morcellement is performed, the bed of the tumor should be curetted. Earlier writers, e. g., Moore,[1] advised against removing the cricoid cartilage or weakening its arch, because stenosis of the lower part of the glottis or of the trachea might result. However, if one employs a prosthesis, e. g., a core mold or a rubber tube, as was done in our case, it is not likely that stenosis will develop. Total removal of the tumor is of paramount importance, as there are satisfactory methods of treating stenosis of the larynx or of the upper part of the trachea if it should occur.

Total laryngectomy has been advocated. This seems unnecessary and too radical. Extralaryngeal resection of the tumor is not as sound as the submucous procedure in the approach by thyrofissure, and injury to the recurrent laryngeal nerve might occur with this method.

REPORT OF A CASE

J. T., a white man aged 77, was referred to me at Aultman Hospital by Dr. L. L. Frick, of North Canton, Ohio, on May 9, 1945, with the request that the cause of dyspnea be investigated. The patient was moribund in an oxygen tent. He presented marked cyanosis, severe dyspnea and orthopnea and was just barely conscious. Respirations were 60 per minute, the pulse 110 per minute and the temperature 100.6 F. The larynx could not be visualized at this time, because of the weak condition of the patient. A firm rounded mass, the size of a large hazelnut, was palpable in relation to the cricothyroid junction on the right. There was marked inspiratory intercostal retraction, also retraction of the suprasternal notch. There were rales scattered throughout the chest. The other thoracic findings were those of inadequate respiratory exchange.

An orderly tracheotomy was performed in the lower part of the neck, local anesthesia being used. About one-half ounce of thick green fibrinopurulent exudate was coughed out through the tracheotomy opening. On the seventh postoperative day, mirror examination of the larynx revealed a convex ovoid grayish yellow mass beginning cranially in relation to the right vocal cord and vallecula and losing itself caudally as an obstructive swelling. The mass extended into the lumen of the larynx and trachea to such a degree as to almost occlude them. There was also some rotation of the right false and true cords and aryepiglottic fold to the right and dorsally. A roentgen examination of the larynx was made by Dr. D. J. Tschetter on May 12 and reported as follows: "This examination demonstrated a large tumor involving the posterior wall of the trachea, the tumor beginning at the lower level of the epiglottis and extending downward and into the larynx. There is involvement of the posterior wall and definite tracheal compression, as seen in the anteroposterior view. A tracheotomy tube is in situ. Roentgen examination of the chest reveals definite infiltrative lesions involving the lower lobe of the right lung. This has all the characteristics of bronchopneumonia. The middle lobe of the same lung is also involved. Old calcifications are seen in the left hilus. The heart is normal in size. There are some markings in the mediastinum, but this is not unusual for a person of this age. The left half of the diaphragm is slightly elevated but smooth; the right half is definitely roughened. There is no evidence of the tumor's having metastasized to the ribs." Another examination of the chest was made on May 16—a single posterior-anterior study: "There has been a spectacular degree of improvement in the roentgenographic

appearance of the pneumonic process involving the middle and lower lobes of the right lung since the previous examination. Resolution has not been complete. Impression: (1) tumor of the trachea and larynx; (2) bronchopneumonia middle and lower lobes of the right lung, with considerable improvement over a period of four days."

As the patient recovered following the tracheotomy, it was learned that for a period of three years he had a gradually increasing sense of stiffness and pressure in the region of the larynx, which was accentuated during colds. Hoarseness was present, which had been interpreted as chronic laryngitis. On several occasions when

Fig. 2.—Roentgenogram made after tracheotomy. Note the large size of the laryngeal chondroma.

he had a cold, he had been hospitalized because of "obstructive edema," and it had also been stated that he had "pneumonia." There had been no loss of weight or of appetite, but there had been increasing physical incapacitation.

On July 21 he was admitted to Mercy Hospital. The physical findings were unchanged. The laboratory data were as follows: The urine was acid, with a specific gravity of 1.018; albumin and sugar were not evident; there were no pathologic microscopic changes. The blood urea was 24 mg. and the blood sugar 108 mg. per hundred cubic centimeters. The bleeding and coagulation times were within normal limits. The red blood cell count was 4,040,000; the hemoglobin

content, 64 per cent; the color index, 64 per cent; the white blood cell count, 7,700; the differential enumeration was normal.

The report of Dr. G. D. Popoff, radiologist at Mercy Hospital, made on October 5, was as follows: "A roentgen examination of the neck was made, in bilateral projection to demonstrate the soft tissues, particularly the hypopharynx, larynx and cervical trachea. The normal structure of the larynx and cervical trachea is completely distorted by a sessile soft tissue tumor, the base of the tumor being located on the posterior wall of the trachea and larynx. The tumor measures 3 by 6 cm. in its diameter, and the air column is displaced anteriorly. The false and true vocal cords are completely obliterated. A tracheotomy tube is demonstrated in situ."

On July 23, with nitrous oxide and oxygen being administered through a cannula placed in the tracheotomy stoma, a midline incision was made from the level of the hyoid bone to the upper margin of the tracheotomy wound, and the soft tissues were dissected to expose a mass attached to the right side of the larynx. The thyroid cartilage was incised in the midline to expose the larynx. A grayish yellow, coarsely nodular, friable mass about the size of a hen's egg was found in the region of the right side of the cricoid cartilage. It extended cranially up to the vallecula on the right and caudally as far as the second ring of the trachea. The cricoid cartilage did not exist as such, having been destroyed by pressure of the tumor. The small nodule felt to the right of the larynx was attached to the main mass of the tumor by a fleshy isthmus. It was planned to remove the tumor by submucous dissection of its mesial aspect. However, the mucous membrane of the trachea and larynx in the region of the tumor was so atrophic that this could not be accomplished without sacrificing it. Therefore, when the removal of the tumor was completed, the right side of the anterior portion of the cricoid cartilage and the right half of the first two tracheal rings were not present. A piece of firm rubber tubing, the caliber of the trachea, was placed so as to extend from the region of the under surface of the vocal cords to the upper margin of the tracheotomy opening and was maintained in situ by two silver wires which passed from the caudal end of the rubber tubing through the tracheotomy opening to be attached to tapes tied around the neck. The wound was closed in layers. The postoperative course was uneventful.

On September 7 the patient was readmitted to Mercy Hospital; anesthesia was induced with pentothal sodium, the rubber tube was removed through the tracheotomy opening, the silver wires being used for traction and guidance. Ten days later the tracheotomy tube was removed. The patient has made an uneventful recovery. He now has a normal voice, and direct and indirect examination of the larynx reveal no trace of the tumor.

610 North Market Street.

DISCOVERY AND EVALUATION OF OTIC CRIPPLES

EDMUND PRINCE FOWLER Jr., M.D.
NEW YORK

THE DEAF and hard of hearing are practically ignored as compared with other types of cripples. Helen Keller has been heard to say that to be deaf is worse than to be blind. The handicap from blindness or from poliomyelitis is usually obvious; that from deafness is not. Because deafness is not obvious, the general public has no idea that the hard of hearing are being neglected. Few educators, welfare workers or doctors know how serious a handicap deafness can be. The deafened often do not realize how much they do not hear. They forget, or do not know what it is like, to carry on a normal life. They usually tend to retire into a shell, but occasionally they react the other way and dominate conversation so that nobody else can talk. Yet if they are discovered and their deafness is properly appraised, many can be helped and some can be cured.[1]

Twenty-four years ago a method and a machine for testing hearing, comparable in accuracy to the well known Snellen eye chart, was presented to this society and placed on the market.[2] This machine, called an audiometer, has come to be recognized among experts as the most reliable standard for testing hearing so far invented. But it is not used except under exceptional circumstances. It is not even the standard for the armed forces or for medicolegal cases. Consequently persons who have incurred deafness are not equitably compensated for their handicap.

The problem is large; for example, 12,000 veterans are being paid compensation for deafness allegedly sustained in the last war. Every otologist knows that there are others that should receive compensation and that some of those who receive it are not entitled to it. It is estimated that several times as many men were deafened by World War II, but nobody knows how many there really are or how much they were deafened. There is no way to be sure because these men were not tested with the audiometer before induction. Still less is known about those deafened in the noisy trades, such as shipbuilding.

There have already been more than 15,000 admissions to the Army and Navy rehabilitation centers for the deaf. Of course, only the

---

From the Vanderbilt Clinic, Columbia-Presbyterian Medical Center.

Read at the meeting of the American Laryngological, Rhinological and Otological Society, Inc., in Chicago, May 28, 1946.

1. Caplan, D. A.: A Special Report of Retardation of Children with Impaired Hearing, Am. Ann. Deaf **82**:234-243 (May) 1937.

2. Fowler, E. P., and Wegel, R. L.: Audiometric Methods and Their Application, Tr. Am. Laryng., Rhin. & Otol. Soc. **28**:98, 1922.

seriously deafened were sent to these centers. From 40 to 50 per cent of these were found to have been deaf before they entered the service. This is additional proof that induction tests were inadequate. But men are still being inducted into the Army and the Navy by the same old methods.[3]

Failure to do any tests or the use of antiquated methods in spite of the availability of accurate audiometry has clouded the problem of deafness. The most serious obstacle to the establishment of routine audiometric methods for the screening and measurement of deafness and the establishment of proper standards of compensation has been the insistence of certain badly informed persons of influence that the old-fashioned voice and whisper tests are adequate. This has been

*Loudness of Voice and Whisper of Various Examiners Measured with a General Radio Sound Level Meter (Decibel Meter)**

	Sound-Damped Room				Ordinary Room			
	Voice		Whisper		Voice		Whisper	
	15 Ft.	5 Ft.	15 Ft.	5 Ft.	15 Ft.	5 Ft.	15 Ft.	5 Ft.
Flight surgeon A	46 db	44 db	44 db	44 db	54 db	53 db	48 db	48 db
Flight surgeon B	52	64	43	50	67	68	48	52
Navy otologist	46	47	46	41	51	51	51	50
Deaf Army physician	53	64	40	42	60	62	50	49
Army otologist 1	43	40	42	40	43	43	41	41
Army otologist 2	42	42	33	32	52	51	47	46
Army otologist 3	48	48	34	34	58	62	42	42
Army otologist 4	48	52	41	41	56	56	44	44
Immediately after conversation	..	..	..	..	66	60	58	58
Civilian otologist 1	58	58	41	42	58	58	45	45
Civilian otologist 2	48	44	46	42	49	49	46	46
Civilian otologist 3	47	44	36	36	48	49	40	40
Bárány noise apparatus	63	66	..	..	69	70		
Phonograph speech	66	70	..	..	70	70		

* This table demonstrates quantitatively the absurdity of testing with voice and whisper and recording the results in feet. In only 1 instance, in which the examiner was a deafened Army doctor, was there more than 4 decibels difference between 15 feet and 5 feet. In general there is little change in the loudness of the voice at 15 feet and 5 feet. Note also that there is tremendous variation of the various voices, particularly in an ordinary room. The ambient noise in the sound-damped room was 28 to 35 decibels; that in an ordinary room, 40 to 65 decibels, with a few sudden peaks that were louder. Several other examiners were tested in the sound-damped room but are omitted from the table because they were not tested also in the ordinary room. The difference between 15 feet and 5 feet was in no case more than 2 decibels and except for a few using whisper it was exactly the same at both distances with all these examiners.

the trouble not only in the Army, the Navy and the Air Force but also in most schools and in medicolegal courts.

The distance that voice and whisper can be heard has been shown repeatedly to vary up to 200 per cent.[4] The main reason is ambient testing room noise which changes the already variable voices of the examiners and has a different effect on normal, nerve deafened and conduction deafened listeners. The conduction and reflection of sound by the walls, the floor and the ceiling of a room are also important factors.

3. Truex, E. H.: Chronic Deafness: Its Treatment in the Army, Ann. Otolaryng. **54**:466 (Sept.) 1945.

4. Bunch, C. C.: Methods of Testing Hearing in Infants and Young Children, J. Pediat. **5**:535 (Oct.) 1934. Fowler, E. P., Jr.: Extraneous Factors in Quantitative Tests for Hearing, Acta oto-laryng. **28**:283, 1940.

A source of inaccuracy in voice and whisper tests not hitherto emphasized, the reflex of raising the voice with distance, is particularly interesting (table). Examinations made with a sound level meter (fig. 1) by Army and Navy Medical officers, who were well versed in the method of testing hearing in their respective services, and by several well known otologists showed that there is as a rule no correlation between loudness of the examiner's voice and the distance of the examiner from the patient (fig. 2). The reflex of raising the voice with distance is so strong that, with the exception of 3 of the otologists, there was no change in loudness of the whisper and the

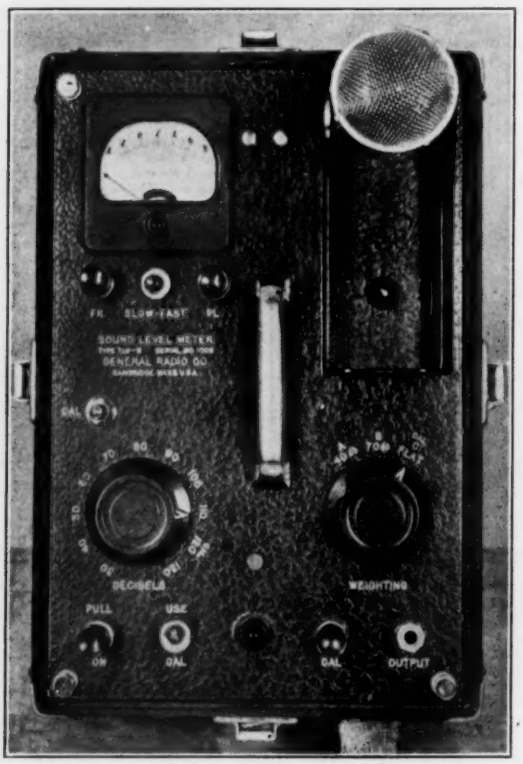

Fig. 1.—Sound level meter (decibel meter) manufactured by the General Radio Company, Cambridge, Mass. The microphone is in the upper right hand corner; loudness is read by adding the reading of the voltmeter in the left upper corner to the setting of the dial at the lower left. This is a most useful instrument for testing ambient noise as well as for making controlled speech tests as shown in figure 2.

spoken word reaching the sound level meter and the testee at 15 feet (5 meters) and 5 feet (1.5 meters) in a sound-treated room (ambient noise level, 28 to 35 decibels). Often the loudness of the spoken voice reaching the decibel meter and the patient was greater at 15 feet than at 5 feet. Add to this the known fact that voices are different and that ambient noise and wall conduction are ever present artefacts in all hearing tests, and it becomes apparent why in an ordinary room (noise

level, 40 to 65 decibels) the loudness of the spoken voice is completely unpredictable. After a bit of conversation, for example, the tests were always 10 decibels higher, and after loud conversation, as much as 20 decibels higher. Imagine what the levels must be on some of our processing lines on airfields while a few planes are circling about. With the variation so marked with these trained professional men, imagine what it must be with hastily instructed enlisted personnel and the like. A little study of the loudness levels of the various voices in the table should demonstrate beyond doubt the absurdity of a regulation which allows a man to serve in our fleet at sea if his hearing is rated 8/15 but will not let him so serve if the rating is 7/15.

To some otologists these remarks may seem superfluous. Perhaps they have not argued with those who say there is no evidence that voice and whisper tests are not adequate. It is sometimes contended that liminal pure tone and speech tests done with machines also leave much to be desired. With this I agree, but there would never be any progress if one insisted that every detail of a method be perfect before one accepted or used it. Suffice it to reiterate that pure tone

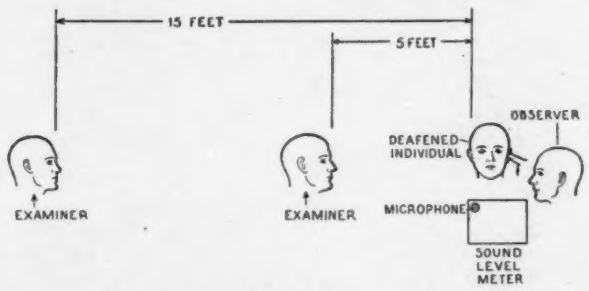

Fig. 2.—The method of testing used in the study recorded in the table. In the service tests, as recommended, the observer stands behind the patient and acts as a control. In practice this is rarely done.

audiometry is the best single standard that has been invented to date, and it behooves otologists to use it. Of course, there are other accurate methods of testing hearing—notably those with speech monitored directly or indirectly. But the voice is hard to standardize and it gives one little information as to diagnosis and prognosis as does the pure tone audiogram. Besides it is not necessary to test with speech in order to calculate the capacity to hear speech.[5] It is possible to calculate percentage or capacity to hear speech from pure tone audiograms, and it is possible to categorize patients from these calculations.[6]

Until recently the Western Electric 4A or other phonograph-audiometers using spoken numbers of fading intensity for sound was the

5. Fowler, E. P.: Measuring Capacity to Hear Speech, Arch. Otolaryng. **36**:874 (Dec.) 1942.

6. Carter, H. A.: Review of Methods for Estimating Percentage of Loss of Hearing, Arch. Otolaryng. **37**:138 (Jan.) 1943. Neil, J. H.: Testing Auditory Acuity in Soldiers and Assessing Overall Capacity to Hear Speech, New Zealand M. J. **42**:218 (Oct.) 1943.

quickest and most accurate method available for screening out deafened persons from the normal population. In many forward communities, its routine use in schools (fig. 3) has saved time by discovering unsuspected hard of hearing children.[7] It has undoubtedly saved the hearing of thousands and has provided otologists with statistics concerning deafened school children. The recommendation that it be used for the services before the war was ignored.[8]

As knowledge of otology and acoustics has advanced, however, it has become apparent that persons with potential deafness are not all screened out by this type of phonograph-audiometer test. Thus the very persons whom one is most anxious to discover are missed. It has also been shown that high tone losses, especially in children, are often a sign of trouble ahead. Most speech tests do not pick up high tone losses.

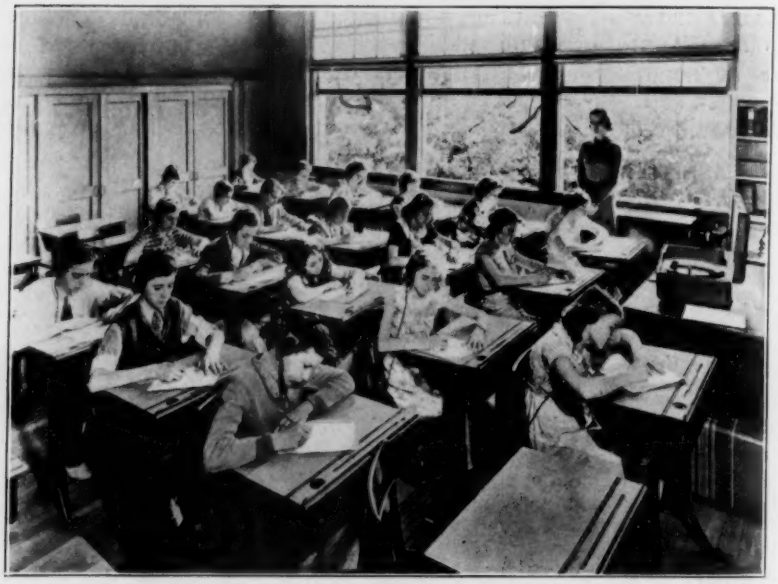

Fig. 3.—Phonograph-audiometer survey as made in a school. The photograph was made available through the courtesy of the Bell Telephone Laboratories.

It has been suggested, therefore, that pure tone phonograph records be made to cover a wider sound spectrum. To make and maintain the accuracy of such a phonograph record is technically difficult. As an alternative, it has been advocated that "sweep" tests of school children[9] and service personnel be made with a standard audiometer. This is feasible and is done in the following manner:

---

7. Fowler, E. P., and Fletcher, H.: Three Million Deafened School Children: Their Detection and Treatment, J. A. M. A. **87**:1877 (Dec. 4) 1926.

8. Bunch, C. C.: Group Hearing Testing, in Manual of Ophthalmology and Otolaryngology, National Research Council, Philadelphia, W. B. Saunders Company. 1942.

9. Kinney, C. E.: Cleveland Hearing Conservation Program, Tr. Am. Acad. Ophth **50**:94 (Nov.-Dec.) 1945.

Small groups are tested one at a time in a quiet room where a suitable audiometer has been set up (of course, a soundproof room is best). The intensity dial is set 5 decibels above the threshold for a normal person under the prevailing noise conditions, and then the frequency dial is swept across the frequency scale. Under quiet rather than soundproof conditions the setting on most audiometers is usually about 15 decibels. The patient indicates by raising his hand that he hears each frequency that is turned on with the silent shut-off switch as the sweep across the scale is made. More accurate is the method of presenting one, two or three spurts of tone at each frequency. If the patient knows how many spurts

Fig. 4.—Conventional pure tone audiometry. As each signal is heard, the patient raises his hand. With small children it is often better to use one, two or three spurts of tone, the child telling the operator how many spurts he hears.

of tone were delivered, he obviously heard the test frequency. This method has been successfully used with children 4 years old, that is, prekindergarten age. A lower threshold can be obtained if each frequency is presented once 5 decibels above threshold and then again at normal threshold. The sweep type of test is best performed with a Maico or a Sonotone audiometer since with these the intensity dial does not have to be altered for various frequencies.

If the testee does not hear all the frequencies normally, louder levels are tried at once, or he is held for further testing, depending on what seems expedient. If many persons in the group being tested have losses, it saves time to finish the

testing of each one at a single setting. If many show normal hearing thresholds, it is well to get them out of the way, so that their time will not be wasted while those with abnormal thresholds are being tested.

Screening tests of groups in which most of the members tested are adult and have normal or near normal hearing can be performed at the rate of 25 to 30 persons per hour, with two minutes being allowed for each. If many have abnormal thresholds for even a few notes—e. g., service personnel who have been in battle [10]—this rate is reduced to 14 per hour or 4.2 minutes per man. The sweep test method is recommended for medium-sized groups of patients, for groups for whom large quiet rooms are not available and groups in which most of the persons to be tested are expected to be normal. It is not as rapid as phonograph-audiometry, but it covers a wider sound spectrum than the commonly used fading speech sound source, and it immediately provides a basic liminal level, the audiogram, which can be employed for diagnosis and prognosis. It requires only a regularly available type of audiometer, a small quiet testing room and a trained operator.

Fig. 5.—Testing at the World's Fair 1939-1940. The photograph was made available through the courtesy of the Bell Telephone Laboratories.

At the 1939-1940 World's Fair, the Bell Telephone Company demonstrated a new method for group pure tone audiometry (fig. 5).[11]

Essentially this method consists in having each patient of a group adjust a high quality receiver to one of his ears. The receivers are matched as to output for each frequency and are connected in parallel. Pure tones of low, medium and high pitch are then delivered through the receiver in spurts of tone in decreasing intensities. The patient writes down on a prepared form how many spurts of sound he heard (fig. 6). He is told that when he no longer hears the spurts of any one frequency he is to write nothing until the next time he hears a tone. When he has been tested at several frequencies and intensities, what he has written is checked against the correct numbers, which are watermarked on the paper and can be seen by transillumination. The score of correct answers can be

10. Hoople, G.: Unrecognized Battle Noise Trauma, Tr. Am. Otol. Soc., 1946, to be published.

11. Steinberg, J. C.; Montgomery, H. C., and Gardner, M. B.: Testing America's Ears, J. Acoust. Soc. America **12**:291, 1940. Hunt, F. L.: Testing America's Ears, Bell Telephone Company Quart. **19**:266 (Oct.) 1940.

interpolated into decibel losses. If large numbers of patients are being tested, the sheets if properly designed can be counted and scored by International Business Machines.

Schilling and Harris at the Navy's submarine school at New London, Conn., have adapted the Bell Telephone method to a standard audiometer and find it quite as accurate as individual pure tone audiometry.[12] The school uses a Western Electric 6B audiometer simply recalibrated for extra receivers. This is done by having a few normal persons who were selected by the usual individual method determine their limen with matched receivers in parallel (fig. 7). If any of the receivers does not match within 5 decibels, it is replaced or discarded. The corrected normal threshold for each frequency is then applied to a detachable ring on the intensity dial of the audiometer. If a Maico or a Sonotone or other type of audiometer is used, the correction factor is applied when one is scoring each patient's form (figs. 8 and 9). The correction factor for 15 receivers is never more than 20 decibels for any frequency and is often nothing at all. It averages 5 decibels with high quality matched receivers.

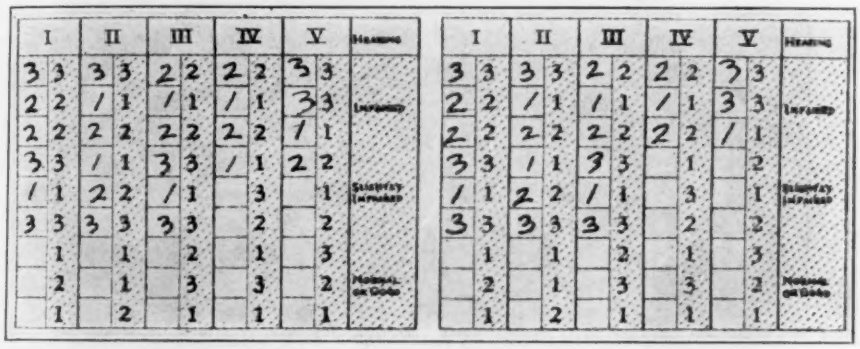

Fig. 6.—Cards used for recording of hearing at the World's Fair as shown in figure 5. The numbers to the right of each column were watermarked in the paper and could be seen only by transillumination. The cord on the left is representative of the average woman, and that on the right, of the average man, in the 50 to 59 year age group. The many blank spaces in the last two columns indicate loss of hearing for high notes. The photograph was made available through the courtesy of the Bell Telephone Laboratories.

With 40 receivers it theoretically could be as much as 40 decibels for frequency 256, which would give the test a range of only 40 decibels. Therefore, really deafened persons cannot be tested with 40 receivers unless a small amplifier is added to the standard audiometer circuit. However, screening tests can be done with 40 receivers and no other extra equipment. It is usual to start screening tests at 30 decibels.

The New London method solves one of the main objections to audiometry, namely, that it took too long to be practical with large groups of people. On the average, using 30 decibels as the highest grade of loudness presented and covering the octaves from 256 to 8192, one can screen a group of men in ten minutes. With 15 receivers being used this is

12. Harris, D. J.: Group Audiometry, J. Acoust. Soc. America **17**:73 (July) 1945.

forty seconds per man; with 40 receivers it is less than fifteen seconds per man. When the test is finished, an accurate measure of the man's hearing is on record. If the man is later subjected to deafening influences, the test can be repeated with the same accuracy by others using either group audiometry or the more familiar types of audiometry. The New London method has the further advantage that it utilizes standard and readily available equipment, which can also be used for individual tests of air and bone conduction, loudness balance and the like with those who are found to need these tests. When the size of the testing load or the available quiet testing room does not warrant employment of group pure tone audiometry, sweep tests and individual tests can be performed without purchasing other apparatus. This is the kind of efficiency and flexibility that the Armed Forces need.

With the screened-out deafened service personnel and routine clinic patients any method takes longer. When the New London technic is

Fig. 7.—Pure tone group audiometry, a standard audiometer being used.

applied, with 15 receivers being used, for all octaves between 256 and 8192 and all intensities from 0 to 80, it requires about forty-five minutes for both ears. This is three minutes per man. With 40 receivers and the necessary amplifier, it is just over one minute per man.

Children take somewhat longer to organize than Army and Navy personnel, but it is easier for them to mark down how many spurts of pure tone they hear than it is to write down numbers spoken by a phonograph. With the phonograph-audiometer and 40 receivers it is possible to test about 100 children per hour.[13] Presumably it would take the same time or less with pure tone group audiometry.

There is no excuse for the argument that screening tests are too expensive. The discovery of the deafened children was found to save

13. Newhart, H.: Diagnostic School Clinic in Public Schools as Factor in Conservation of Hearing, J. A. M. A. **87**:1882 (Dec. 4) 1926.

money for the boards of education who inaugurated this system.[14] When these children were discovered, put in the front of the room or medically treated for their deafness, they no longer repeated terms as did the stupid

PURE TONE GROUP HEARING TEST Date_____

PRINT:_____ _____ _____
(last name first) (age) (chart no.)

This is a test of your ability to hear very weak tones. You should try to do as well as possible in order to see how good your ears really are.

DIRECTIONS: (1) Find the column representing the frequency of the tone (256, 512, etc.), which the examiner will announce.

(2) The examiner will call out the letters one at a time and will present one, two or more spurts of tone to your headphone each time he calls a letter.

(3) You are to work down the column as the letters are called, and write down how many spurts of tone you hear for each letter. If you do not hear a tone for a certain letter, do not make any marks. Simply wait for the next letter.

RIGHT EAR MASTER _____

	256	512	1024	2048	2896	4096	8192	
A								A
B								B
C								C
D								D
E								E
F								F
G								G
H								H
I								I
J								J
K								K
L								L
M								M
N								N
O								O
P								P
Q								Q

Fig. 8—Test form used by the patient. Starting in the column for frequency 256, he records how many he hears of spurts of tone decreasing in 10 decibel steps from 90 decibels to threshold, then increasing from 5 decibels to 55 decibels. This continues for each of the notes tested.

14. Newhart, H.: The Early Detection and Treatment of Defective Hearing in Children, J. A. M. A. **109**:1620 (Nov. 13) 1937. Berry, G.: Management of the Deaf and Hard of Hearing, in Fowler, E. P., Jr.: Medicine of the Ear, New York, Thos. Nelson & Sons, 1939, p. 562.

children in the class, and the avoidance of repetition saved money, not to mention what it saved in human suffering. There are estimated to be 4,000,000 deafened pupils in school and college, and more than a third of these do not know that they are hard of hearing, yet in only a handful of communities is there routine testing of school children.

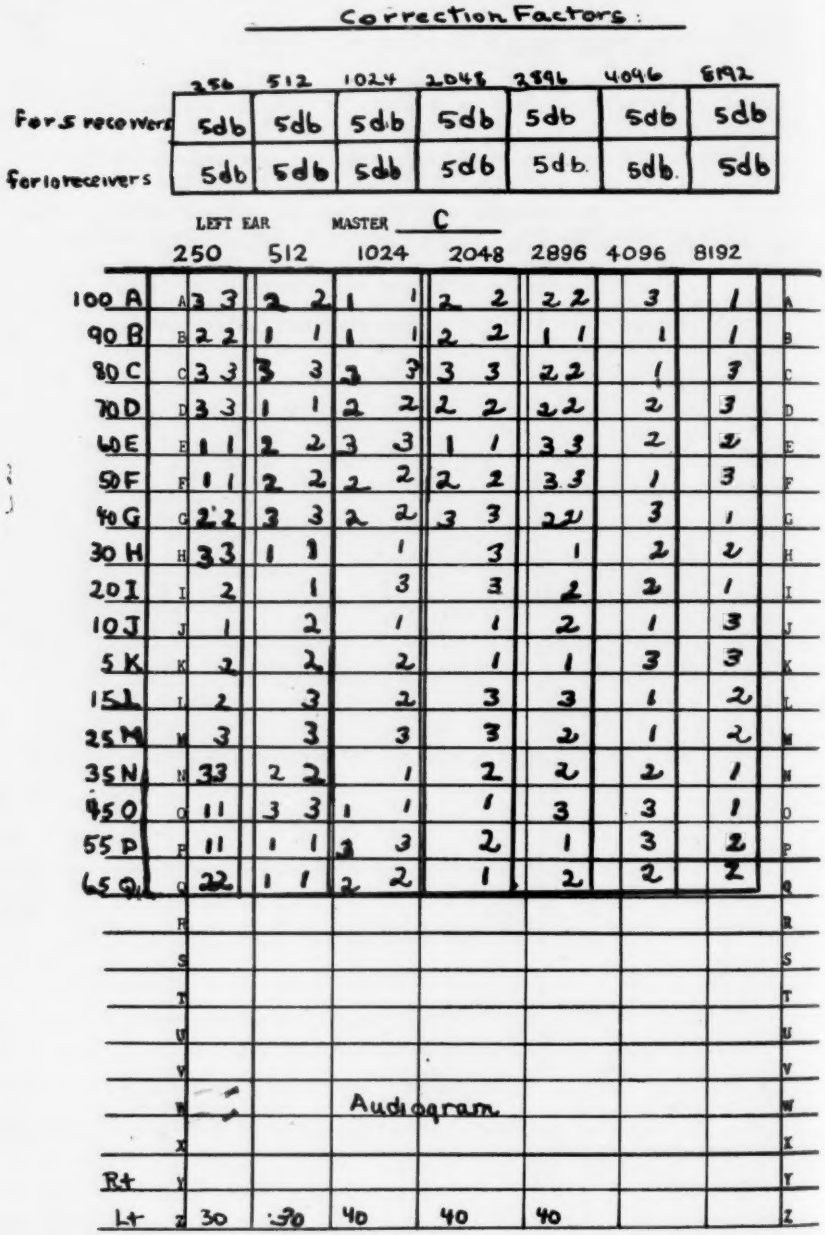

Fig. 9.—Overlay for scoring of the patient's form in place for checking. If the use of extra receivers requires a correction factor, this is subtracted from the score.

The principal difficulty with pure tone group audiometry is the same as with individual audiometry. To do an accurate test on a relatively normal person a soundproofed room is necessary. Unless the ambient noise level in the room is below 30 decibels, it is idle to think of picking up the 10 decibel losses in high and low tones which are often a sign of trouble in children. However, the receivers will cut out about 20 decibels of noise, so that making any test with them is better than trying to test with voice and whisper in a free field.

The shutting out of extraneous noise must be faced by each institution using the test. In service induction centers, which are notoriously noisy, large soundproof rooms will have to be built. For school testing it is usually possible to find at least one room at the top of the building or in an annex or a basement which is reasonably quiet. The hanging of blankets over windows, blackboards and doors is often useful. Modern school buildings should be built with at least one room which is weather-stripped and sound treated for the purpose of testing hearing. At other times this room may be used by music students and others whose work produces disturbing noises. Canfield suggests that a large soundproofed truck, properly equipped, might tour the schools, especially in rural districts.[15] Such a truck was used by the Royal Canadian Air Force for field surveys.[16]

Group pure tone bone conduction tests are possible, and I am hoping that the head sets will attenuate enough ambient noise so that a fairly accurate test can be obtained. Group bone conduction tests, however, will be necessary only when large groups of deafened persons must be tested quickly. Group fatigue tests should also afford valuable information.[17]

Spot surveys with the audiometer have indicated that half of the 140,000,000 people in the United States have some impairment of hearing.[18] A conservative estimate is that there are 60,000 veterans who have suffered a significant deafness from this war. If they are not discovered, little will be done about them just as little has been done about the school children. The general public should know that there are so many otic cripples. When they do, they will insist that proper tests be made in the Armed Forces, in schools and in industry, where the most good can be done. If otologists do not tell them, nobody will, and the problem of the deafened will stay in most communities where it is now, in oblivion.

180 Fort Washington Avenue.

---

15. Canfield, N.: Personal communication to the author.

16. Sullivan, J.: A Statistical Analysis of an Audiometric Survey in the Royal Canadian Air Force, Tr. Am. Laryng., Rhin. & Otol. Soc., 1946, to be published.

17. Fowler, E. P., Jr.: Causes of Deafness in Flyers, Arch. Otolaryng. **42**:21 (July) 1945. Wilson, W. H.: Prevention of Traumatic Deafness: A Preliminary Report, ibid. **37**:757 (June) 1943.

18. Beasly, W. C.: National Health Surveys Hearing Study Series, United States Public Health Service. 1938.

UNIQUE CASE OF FOREIGN BODY IN THE ESOPHAGUS

VIRGIL J. SCHWARTZ, M.D.
MINNEAPOLIS

LEST the title of this article prove misleading, let it be stated at the outset that the foreign body involved in this report is one of the commonest types found in the food passages, namely, a 25 cent piece. The extraordinary features are the manner and the site of its incarceration.

REPORT OF CASE

J. E., aged 7, accidentally swallowed a quarter. The next morning roentgenograms were made and showed the coin, somewhere in the chest, standing vertically with its long axis in the anteroposterior plane. The anterior view

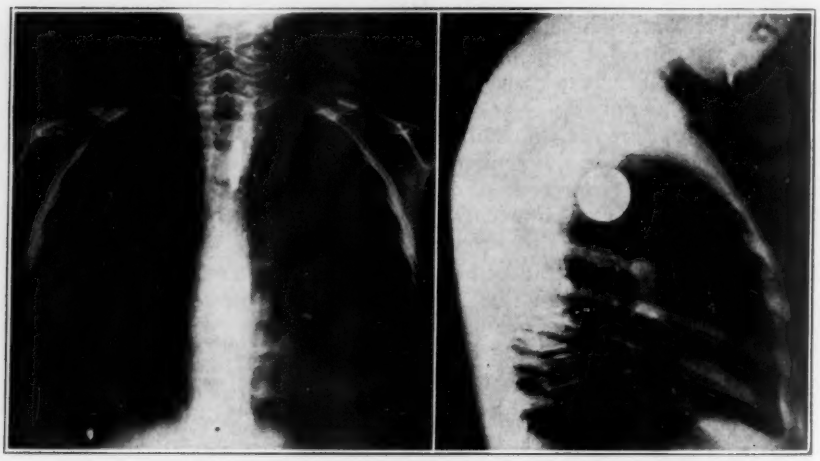

Fig. 1.—Anteroposterior and lateral roentgenographic views of a 25 cent piece lodged in the chest.

showed the linear shadow of the coin edgewise at about the level of the third thoracic vertebra, slightly to the left of the trachea and apparently pressing the latter structure a little to the right. The trachea is often pushed slightly to the right by the aorta also. The lateral view showed the full circular aspect of the quarter, its posterior edge standing just at or slightly anterior to the anterior edge of the body of the vertebra. On remembering that each vertebra is covered with a substantial layer of fascia and tissue, it was reasonable to

Presented before the Minnesota Academy of Ophthalmology and Otolaryngology, March 8, 1946.

infer that the posterior edge of the quarter was actually slightly behind and lateral to the greatest convexity of the soft tissues covering the body of the vertebra.

It has long been taught that when a circular flat foreign body appears in a roentgenogram of the neck or the chest, if its long axis stands in the anteroposterior position, it is probably stuck between the vocal cords, since this position coincides with the long axis of the glottis. If the long axis of the object stands in the coronal plane, it must be lodged in the esophagus, since the long axis of the esophageal diameter is in the coronal plane. The latter must be so because it will be remembered

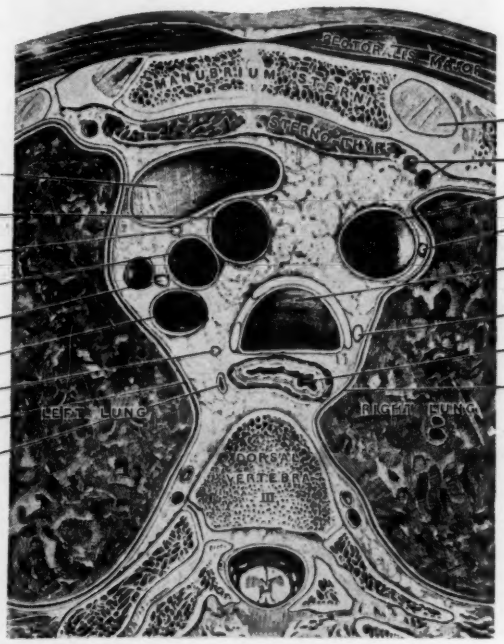

Fig. 2.—Transverse section through the superior mediastinum at the level of the third thoracic vertebra. (Fig. 22 from Cunningham.[2])

that the esophagus is a potential cylindric tube, compressed and flattened anteroposteriorly in the superior mediastinum, between the trachea in front and the bodies of the vertebrae behind. The term "potential" is employed here to emphasize the fact that usually the anterior and posterior esophageal walls are in almost complete apposition; they are normally separated only by food or air. Furthermore, the upper entrance of the esophagus is normally a firm, tightly closed slit lying in the coronal plane, and it opens only under considerable pressure from above or occasionally from below.

The volume published by Jackson and Jackson [1] in 1936 and revised since that time is thorough and authoritative. On page 33 the following statement appears:

Coins and other disklike objects naturally lie in the frontal plane, because the shape and action of the tongue anteriorly combine with those of the posterior pharyngeal wall posteriorly to make the long diameter of the pharyngeal lumen

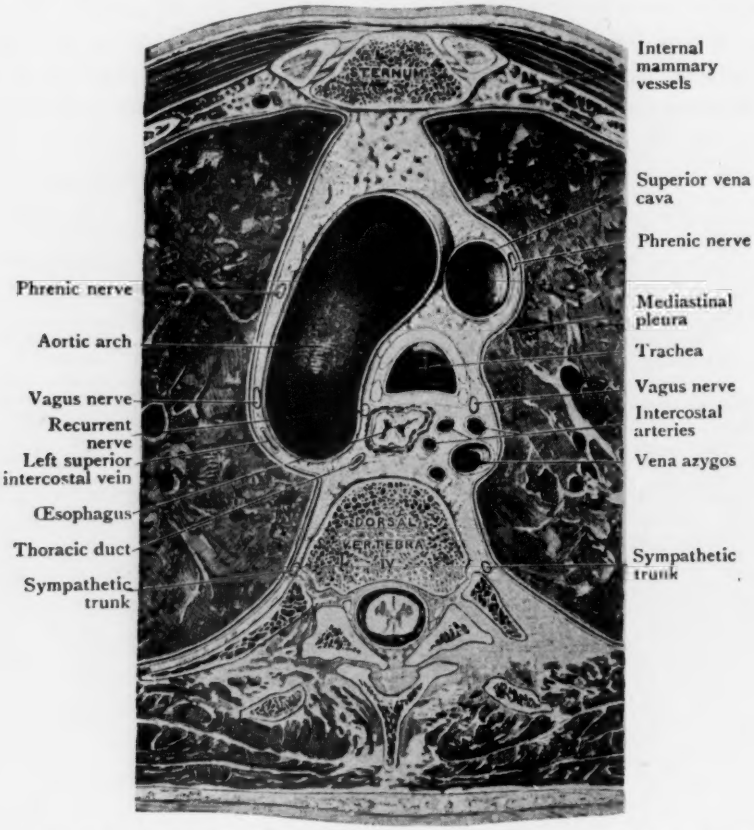

Fig. 3.—Transverse section through the superior mediastinum at the level of the fourth thoracic vertebra. (Fig. 43 from Cunningham.[2])

transverse. On the other hand, to enter the glottis, a flat object must lie in, or nearly in, the sagittal plane. In other words, the muscular activities of the pharynx throw flat foreign bodies into the frontal plane, whereas they must be in the sagittal plane to pass the glottis.

Again, on page 34 they state:

When flat objects like a coin go down, the cricoid cartilage lifts away from the spine, thus opening the pharynx sufficiently to allow the coin to pass with

1. Jackson, C., and Jackson, C. L.: Diseases of Air and Food Passages of Foreign Body Origin, Philadelphia, W. B. Saunders Company, 1936.

its greater diameter coronally placed. On the contrary, when such an object goes down through the larynx it takes a position with its greater plane corresponding to the sagittal plane of the glottis. . . . The relative positions are important for differential diagnosis as to whether the air or the food passage is invaded.

Finally, on page 154 the same thesis is restated thus:

. . . It must be remembered that flat objects like coins always lie with their greatest diameter in the coronal plane when in the esophagus, in the sagittal plane when in the trachea.

How, then, is it possible to explain the roentgenograms in the present case? It may be well to recall that the superior mediastinum

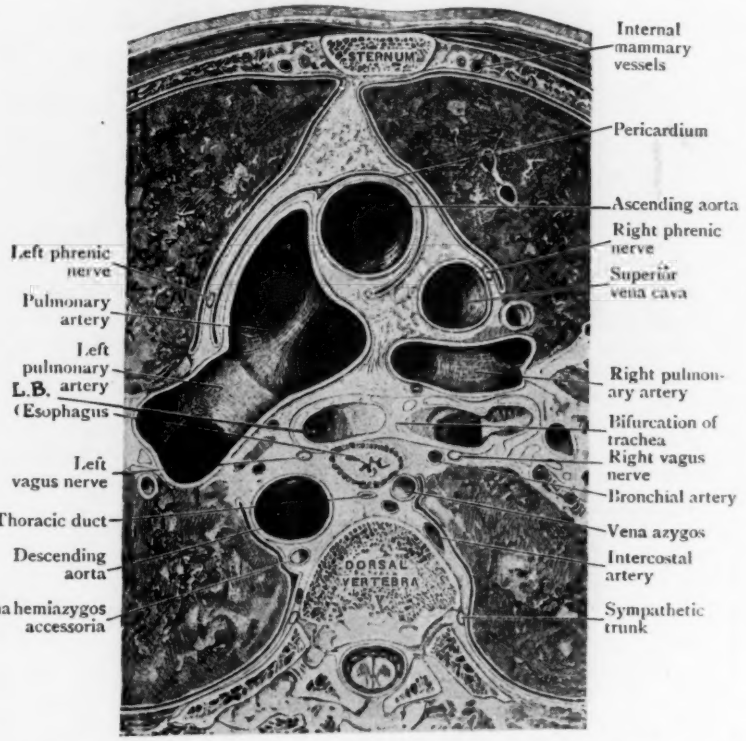

Fig. 4.—Transverse section through the mediastinal space at the level of the fifth thoracic vertebra. (Fig. 42 from Cunningham.[2] *L. B.* has been inserted, indicating the left bronchus.)

contains the trachea, the esophagus, the thoracic duct, the arch of the aorta and many large vessels and nerves. In front of it are the manubrium of the sternum and the origins of the sternohyoid and the sternothyroid muscles. Behind it are the four upper thoracic vertebrae and part of the longus colli muscles. From what has been said it is evident that the esophageal wall is distensible, within limits, so as to permit substantial masses of food to pass.

In the present instance, the only logical explanation of the roentgenograms is as follows:

The coin passed through the esophageal entrance in the usual manner, but somehow it made its way toward the extreme left of the esophagus and turned in an anteroposterior position, perhaps through striking the bulge of the arch of the aorta. Thus the posterior edge of the coin became wedged in an esophageal pocket beside the body of a vertebra, while the anterior edge was similarly

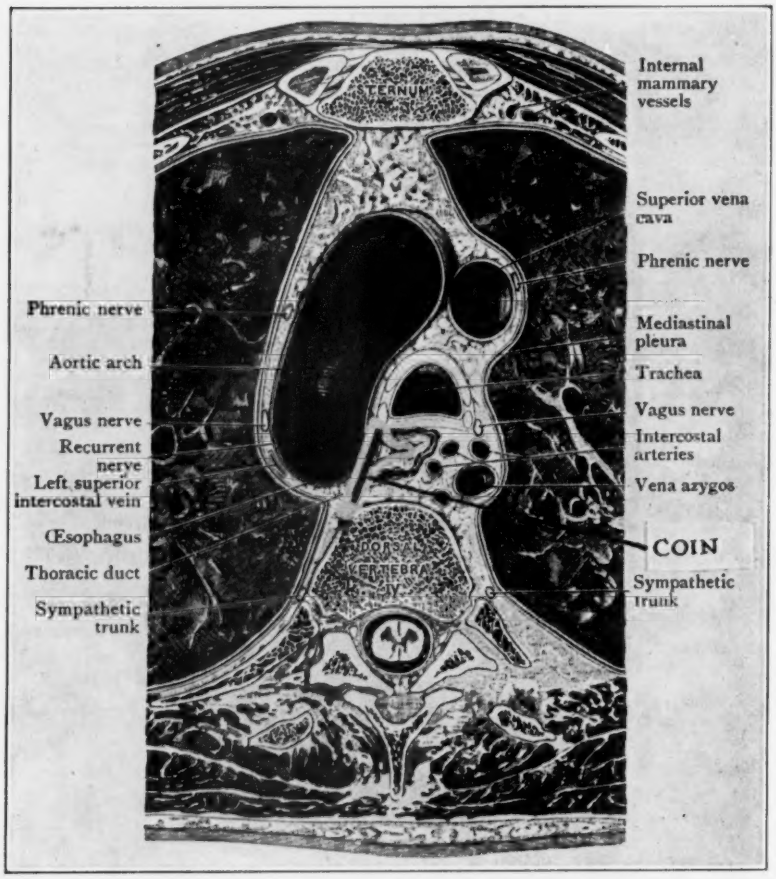

Fig. 5.—Transverse section through the superior mediastinum at the level of the fourth thoracic vertebra. (Fig. 42 from Cunningham[2] modified to show how the left side of the esophagus was distended anteroposteriorly by a coin.)

wedged in a pocket to the left of the trachea. It is even probable that the downward escape of the quarter was prevented by the left main bronchus, which leaves the trachea between the fourth and fifth thoracic vertebrae. Thus the coin was caught laterally by the distended esophageal wall and the arch of the aorta, posteromedially by the vertebra, anteromedially by the trachea and anteroinferiorly by the left main bronchus.

Esophagoscopy revealed precisely the condition described. Since the lumen of the trachea is smaller than the body of a thoracic vertebra, its lateral wall is nearer the midline than that of a vertebra. Furthermore, the aorta seems to press the trachea slightly to the right. This explains why the anterior edge of the quarter was found to stand nearer the midline than the posterior, so that the coin was not in perfect anteroposterior position but was tilted slightly, the anterior edge medialward.

In this position it could not be removed from the esophagus because of the tight upper entrance or slit in the coronal plane. The coin was grasped with the forceps, and after a little manipulation it was freed from its anterior pocket, after which extraction in the coronal plane became a simple matter.

So far as can be ascertained from a search of the literature and from personal communications, this is the first case of its kind on record.

The anatomic explanation of this case becomes clear on studying figures 2 to 5, reproduced from Cunningham's[2] "Manual of Practical Anatomy."

617 Medical Arts Building.

2. Cunningham, D. J.: Manual of Practical Anatomy, ed. 6, London, Oxford University Press, 1914.

AN OPERATION TO IMPROVE HEARING IN CASES OF CONGENITAL ATRESIA OF THE EXTERNAL AUDITORY MEATUS

GEORGE L. PATTEE, M.D.
DENVER

FOR MANY years otolaryngologists have felt that operative attempts to improve hearing in patients with congenital atresia of the external auditory meatus were of so little value that they advised against surgical treatment. Fraser,[1] in reviewing the literature, credited Kiesselbach with the first operation that attempted, in 1883, to correct this malformation. Almost every type of surgical procedure has been tried, including radical mastoidectomy with and without skin grafting. Many operations were doomed to failure because the operator did not understand the embryonal development of the condition. This was especially true of attempts to make a new auditory canal without doing any surgical work on the bone.

The best results from the standpoint of improvement of hearing were reported by Dean and Gittens[2] in 1917. They reviewed the various types of operations that had been tried up to that time. They reported that after operation on a patient with bilateral congenital atresia of the auditory canals, the whispered voice was heard at 40 feet (12 meters). Hume and Owens,[3] in 1935 reported surgical correction of congenital atresia in 2 cases, with improvement of hearing at the end of three months, but gave no quantitative estimate of this improvement.

Beck,[4] in 1925, reported on the psychologic aspects of the problem. He found that the psychologic reaction of most patients to their deformity was improved after an operation to restore a meatus and canal, even though their hearing was not materially improved.

In 1943 the literature was reviewed and brought up to date by Cohen and Fox.[5] The case they reported was one of traumatic rather than congenital atresia of the auditory canal.

---

1. Fraser, J. S.: Maldevelopments of the Auricle, External Acoustic Meatus and Middle Ear, Arch. Otolaryng. **13**:1-6 (Jan.) 1931.

2. Dean, L. W., and Gittens, T. R.: Report of Case of Bilateral, Congenital, Osseous Atresia of the External Auditory Canal, with an Exceptionally Good Functional Result Following Operation, Laryngoscope **27**:461-473 (June) 1917.

3. Hume, J. R., and Owens, N.: Microtia with Meatal Atresia, with Description of an Operation for Its Correction: Report of Two Cases, Ann. Otol., Rhin. & Laryng. **44**:213-219 (March) 1935.

4. Beck, J. C.: The Anatomy, Psychology, Diagnosis, and Treatment of Congenital Malformation and Absence of the Ear, Laryngoscope **35**:813-831 (Nov.) 1925.

(Footnotes continued on next page)

I have found no reports in the literature since the endaural approach and the fenestration technic made possible advances in the surgical treatment of the temporal bone. However, Canfield [6] stated that in a case of bilateral congenital atresia of the auditory canals he operated on one ear using a surgical technic similar to the one that I am reporting. It was too early to determine what the extent of the improvement of hearing was. He has been helpful in outlining the indications for the operation.

Before going into the theory behind the proposed operative technic, it is most important to understand the embryonal developmental defect that produces the malformation. A more detailed embryologic description can be found in articles by Fraser [1] (1931) and Richards [7] (1933), from which the following summary is made.

The external, middle and inner ears develop from different anlages, and hence congenital deformities of these divisions may occur separately. The inner ear is the first to be developed, arising as an invagination of the ectoderm, which separates from the epithelium to form a cyst known as the otocyst. From this develop the cochlea and the labyrinth. Since the inner ear develops before either the middle or the external ear, congenital defects usually occur without associated defects of the other two structures. The congenitally deaf child exhibits such a malformation.

The external ear and the eustachian tube develop from the first pharyngeal pouch. Simultaneously there are an outpocketing of entoderm to form the eustachian tube and a pitting of ectoderm at the site of the future auditory meatus. From the ectoderm a cord of cells extends inward until it comes to lie against the entoderm, where it forms a disklike plate lying in an oblique plane just lateral to the middle ear cavity. This disk with its cord of cells then is canalized from within outward until the external auditory meatus is formed. The auricle develops from a group of skin-covered cartilaginous mounds, which finally fuse to form the concha, the tragus, the helix and associated structures.

The middle ear and the auditory ossicles develop from the visceral or branchial arches. Although the development in man is not so easy to trace as it is in the lower vertebrates, most embryologists agree that the incus and the malleus are formed from that part of the first or mandibular arch known as Meckel's cartilage. The stapes arises from that portion of the second or hyoid arch known as Richert's cartilage. After the incus and the malleus have been formed, the remainder of Meckel's cartilage forms the mandible. After the stapes has been developed, the proximal portion of Reichert's cartilage, known

5. Cohen, L., and Fox, S. L.: Atresia of External Auditory Canal, Arch. Otolaryng. **38**:338-346 (Oct.) 1943; Tr. Am. Laryng., Rhin. & Otol. Soc., 1943, pp. 136-149.

6. Canfield, N.: Personal communication to the author.

7. Richards, L.: Congenital Atresia of the External Auditory Meatus, Ann. Otol., Rhin. & Laryng. **42**:692-711 (Sept.) 1933.

as the laterohyale, forms the styloid process, and the distal portion, the hyoid bone. It is this laterohyale cartilage which plays a most important part in cases of congenital meatal atresia.

The os tympanum or annulus is the final structure contributing to the formation of the external canal and the membrana tympani. It arises directly from membranous bone rather than from cartilage and develops as a U-shaped ring surrounding the ectodermal plate described in the development of the external ear. Subsequently, bony outgrowths of the os tympanum form the sides and the floor of the bony external auditory canal.

In the congenital defect of atresia of the auditory canal, with and without microtia, the deformity involves both the external and the middle ear. If the deformity involves the inner ear, it is merely a coincidental finding and not an associated one. Failure of the ectodermal cord to canalize results in a deformed tympanic bone or none. Failure of the tympanic bone to develop normally leads to overgrowth of bone from the laterohyale cartilage which fills the region of the tympanic membrane and extends outward until it fills most of the space normally occupied by the auditory canal. This deformity is nearly always found, in varying degrees.

Associated with the deformity just described are varying degrees of deformity of the incus and the malleus. In addition, cicatricial fibrotic bands and bony spicules have been reported crossing the middle ear cavity. The incus and the malleus are frequently fused, and are otherwise abnormal in size and shape. Williams [8] reported that in 2 of his surgical cases neither the incus nor the malleus could be identified as such.

Hemiatrophy of the involved side of the face is a frequent accompanying deformity. When it occurs, the misshapen auricle is much farther forward and may overlay the temporomandibular joint. In addition, facial weakness and paresis have been reported.

Patients with this deformity usually consult their physician with a view to improvement of their appearance and hearing. The operation described will improve the appearance, since it produces a meatus and a canal, but the reconstruction of the auricle is a special problem outside the scope of this paper.

As for the hearing, those patients with unilateral deformity have sufficient hearing in the good ear so that no defects of speech occur. Those with bilateral deformity have better hearing than one would expect, since both canals are occluded with bone, but have enough loss of hearing that speech defects are common. It is for these patients that the operation is most urgent. In any case the operation should be postponed until the child has learned to talk, thereby establishing the fact that hearing is present. I think that this is much more important than other criteria that have been recommended in the past, such as reaction of the labyrinth to caloric stimulation, inflatability of the eustach-

8. Williams, H. L.: Personal communication to the author.

ian tube or pneumatization of the mastoid process as demonstrated in roentgenograms.

My interest in these cases was aroused when I was consulted by a girl of high school age who wanted to know if the fenestration operation would restore her hearing. She had unilateral congenital atresia of the auditory canal but no deformity of the auricle. She was a trained musician and her unilateral deafness was troublesome in her orchestral work. It was her audiogram (fig. 1 *A*) which intrigued me, since it so closely resembled those seen in cases of clinical otosclerosis. I reasoned that in her case fixation of the stapes was caused by fixation of the incus and the malleus against the bony plate replacing the membrana tympani. Consequently, if the incus were removed, the motility of the stapes would be restored and an improvement in hearing should result. I explained to her that the operation would be experimental, and as yet she has not had it done. Audiogram of a second case in

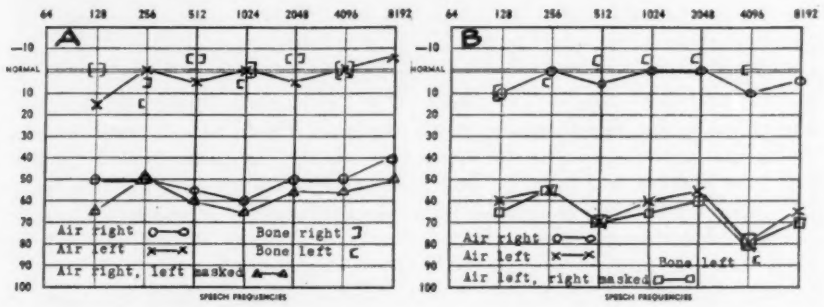

Fig. 1.—*A*, audiogram of P. T., a woman aged 19, with congenital atresia of the right ear. No significant change is seen in air conduction on the right side with the left ear masked. In the Weber test sound was lateralized to the right ear. The Rinne test gave a negative result for the right ear and a positive result for the left. The ear was not operated on.

B, audiogram of G. M., a man aged 25, with congenital atresia of the left ear. No significant change is seen in air conduction on the left side with the right ear masked. In the Weber test sound was lateralized to the left ear. The Rinne test gave a negative result for the left ear and a positive result for the right. The ear was not operated on.

which no operation has been done is shown (fig. 1 *B*), since the patient is an adult and the record is therefore of more value than those for the children of the series.

Soon afterward, Dr. Douglas Macomber, a plastic surgeon, recently returned from duty with the armed services, consulted me about the problem presented by patients with this type of deformity. He found several of them awaiting him on his return to Denver, and it is due to his courtesy and cooperation that the patients were operated on. He was also helpful in cutting the split skin grafts used in the operation.

The technic of the operation is neither difficult nor unusual if the embryologic and abnormal anatomic findings are kept in mind.

An endaural incision is made in such a manner that the cartilaginous portion of the auricle is freed from the tragus. The soft tissues are freed from the underlying mastoid bone and carried backward. In those cases in which the microtic auricle has been held forward by the deformity, this procedure alone adds immeasurably to the cosmetic result.

The normal landmarks for locating the mastoid antrum are not present, since there is no bony canal. In 1 case the outlines of what appeared to be a bony canal were found at a level different from that of the bone occluding the canal, but in the rest, the bone of the mastoid cortex was level and contiguous with the bone of the canal. Thus the anterior border of exposed bone is in reality the anterior inferior border of the canal rather than the posterior superior border. Consequently, the operation is started higher and farther back than would appear necessary.

A complete mastoidectomy is done to prepare a bed for the graft and to insure a large canal. The antrum of the mastoid process is found and the horizontal semicircular canal located. The dissection is now carried forward and superiorly at the level of the horizontal canal, and the incus is exposed and removed. If the malleus is fused to the incus, it is also removed; otherwise it is left intact. The opening into the middle ear must be left as small as possible and still allow the removal of the incus. The reason for this is that the mucous membrane of the middle ear must grow over the inner surface of the graft quickly or the unlined graft may slough. The dissection is then carried forward and inferiorly into the bone that fills the region where the canal should be. A small flat shelf is thus made at the level of the horizontal semicircular canal so that the graft will have support anteriorly in the same plane as the opening into the middle ear. This is in the region where the so-called bridge is encountered in the classic radical mastoidectomy.

A split skin graft is now applied to the entire cavity and held in place by a pressure packing. At first a paraffin-impregnated gauze packing was used, but later, at Dr. Macomber's suggestion, a wet cotton packing proved easier to use. The edges of the graft are sutured to the edges of the incision, and the packing is left in place for five to seven days. After removal of the packing, the canal stays open without further packing, but there is usually a small amount of serous drainage for two or three weeks. This is absorbed by cotton pledgets placed in the canal.

When healing is complete, one sees a large canal and meatus. The opening into the antrum of the mastoid process is covered by a flaccid membrane of epithelium lined by mucous membrane. This membrane can be seen to vibrate when Siegle's otoscope is used to change the pressure in the canal. The sound waves pass directly across the middle ear cavity to the stapes, which can now move freely in the oval window. Theoretically, therefore, hearing should be improved to about the level expected from the fenestration operation.

I have now operated in 3 cases of unilateral involvement and in 1 case of bilateral malformation, with good results in 4 of the 5 ears. In the fifth ear, otitis media developed after the hearing had been improved. Following the infection, granulation tissue partially filled the canal. Regrafting is planned at a later date, when reconstruction of the auricle is begun. A summary of the results obtained in each case follows.

REPORT OF CASES

CASE 1.—E. K., a boy aged 5, had congenital atresia of the right auditory meatus with microtia (fig. 2 *A*). He had no loss of hearing in the good ear and no defect of speech. His parents were anxious to have the microtic ear operated on in order to improve the appearance and if possible to improve the hearing.

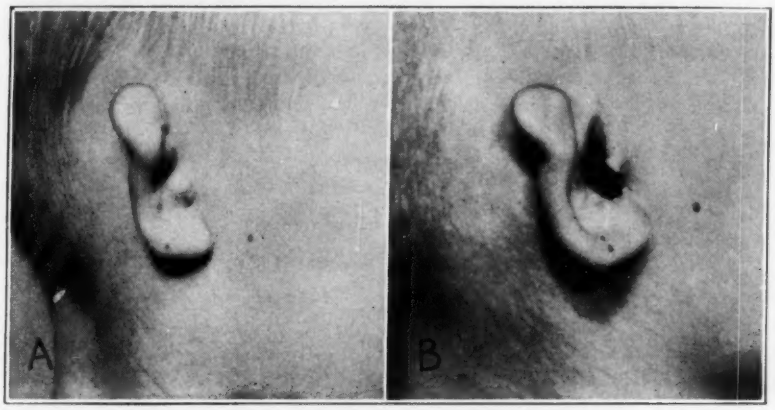

Fig. 2 (case 1).—*A* and *B*, preoperative and postoperative photographs of patient E. K.

An audiogram was made, April 9, 1946, which revealed normal hearing in the left ear and a loss in the right ear averaging 68 decibels in the critical speech frequencies (fig. 3). Bone conduction was normal in both ears. In the Weber test sound was lateralized to the malformed ear. The Rinne test gave a negative

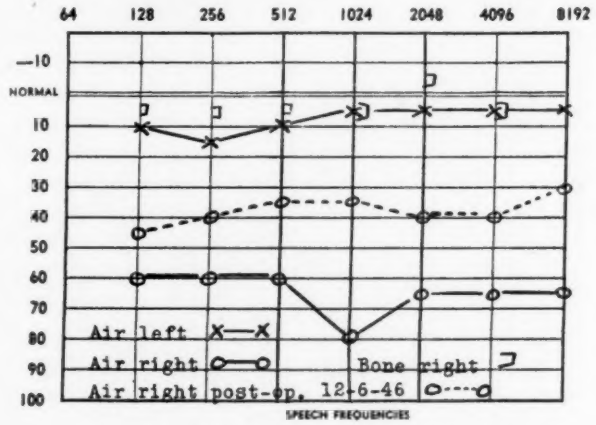

Fig. 3 (case 1).—Audiogram made on April 10, 1946, showing improvement of hearing eight months after surgical treatment of patient E. K.

result for the malformed ear and a positive result for the normal ear. The patient was unusually cooperative for a child of his age and I felt that the audiogram was satisfactory. (Compare it with those in figure 1, made for adults.) Testing with masking was unsatisfactory.

The operation was performed on April 12, 1946. The antrum was found with some difficulty, as this was the first patient operated on. The facial nerve was accidentally exposed but was not damaged, and no paresis resulted. The incus was removed. Both the long and the short processes of the incus were deformed, being shorter and thicker than normal. The malleus was not uncovered. A split skin graft was inserted in the wound and held in place with a paraffin pack. This packing was removed on the sixth day, and the graft was found to be in good condition. The postoperative course was uneventful.

Audiograms taken postoperatively on the eighth day showed an improvement in hearing to the 50 decibel level. Two months after operation the improvement in hearing was up to the 37 decibel level, and is still there after seven months (fig. 3). However, he hears much better than the audiogram indicates, since he can hear a low spoken voice at 40 feet (12 meters) in the corrected ear.

The microtic ear had been bent forward and doubled on itself, and after operation it was turned backward and the appearance improved to a much greater extent than is shown in the photograph (fig. 2 *B*).

Since the operation there has been a decided change in the boy's outlook on life. His teacher comments on how much better behaved he is in school. The mother notices a marked improvement in his disposition, and he is much happier playing with his companions. Strangers no longer ask the mother what is wrong with his ear.

Case 2.—R. C., a boy aged 5, presented congenital atresia of both auditory canals with microtia (fig. 4 *A* and *C*). Two attempts had been made by others to produce patent canals by operations on the soft tissue, using cutaneous grafts to line the newly formed canals. Both attempts had failed even though stent molds had been kept in the canals.

The boy had a bad defect of speech, which his younger brother was imitating instead of imitating the speech of normal companions. He did not understand directions well, and it was impossible to make audiometric studies. There was no doubt, however, that hearing was present. He was able to repeat correctly the loud spoken voice at 8 feet (2.5 meters).

In both of his previous operations there had been some difficulty with the anesthesia; so it was decided to operate on one ear at a time. On May 3, 1946 the right ear was operated on. The antrum was found and the incus exposed without difficulty. The incus was removed, and the deformed malleus was found to be fused with it. The wound was lined with a split skin graft, held in position by a paraffin pack, which came out accidentally on the fifth day. The skin graft seemed intact, but about two weeks later it was noted that a small bit of paraffin had accidentally lodged between the graft and the anterior bony canal wall. After this had been removed, the middle ear discharged for two or three weeks. At the end of a month there had been a marked improvement of hearing. Low whispered speech was heard and repeated at 2 feet (61 cm.).

On August 29 the left ear was operated on, the technic described being used. Again the incus and the malleus were fused and were almost identical with those found in the right ear (fig. 5). The split skin graft this time was held in place by a wet cotton packing, which was removed on the seventh day. The graft took well, and the healing was uneventful.

The cosmetic result was not so good in this case as in the previous one because there was not as much auricle to begin with, and the previous operations had left grafted skin in the region of the meatus. However, the boy's attitude has entirely changed, and he is happier with his playmates. He has now started

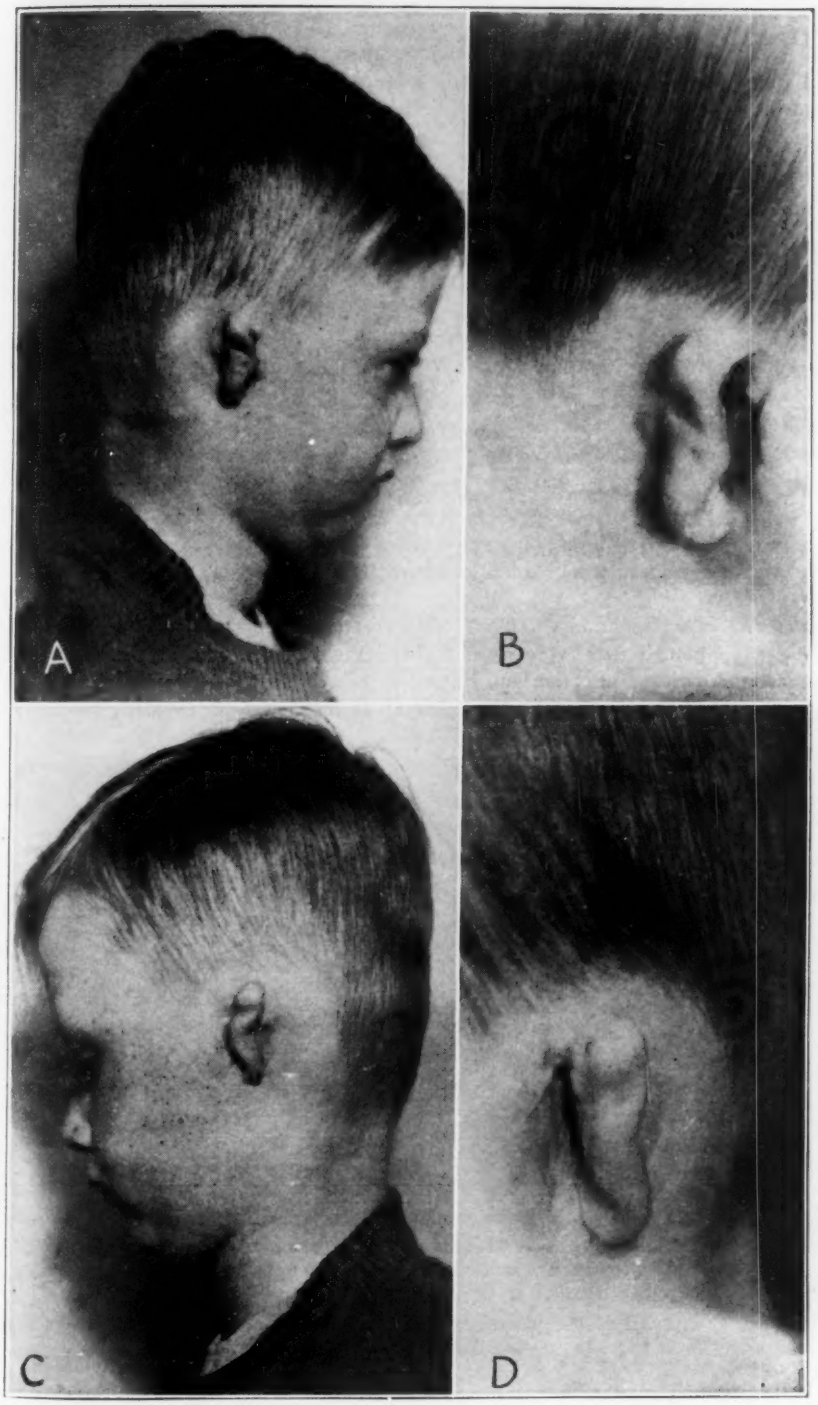

Fig. 4 (case 2).—Bilateral atresia of the external auditory canal: *A* and *B*, preoperative and postoperative appearance of the right ear; *C* and *D*, preoperative and postoperative appearance of the left ear. The preoperative photographs illustrate the bending forward of the microtic auricle better than do the rest of the series. The cosmetic improvement obtained by allowing the auricle to turn backward is not well illustrated by the photographs.

to go to school for the first time, so the report of the teacher cannot be included, but the mother says he is doing much better in all social activities.

It is still impossible to get the boy to respond to audiometric testing. However, he is able to hear and repeat correctly words spoken in a low conversational voice at 40 feet (12 meters). His mother has made this interesting comment

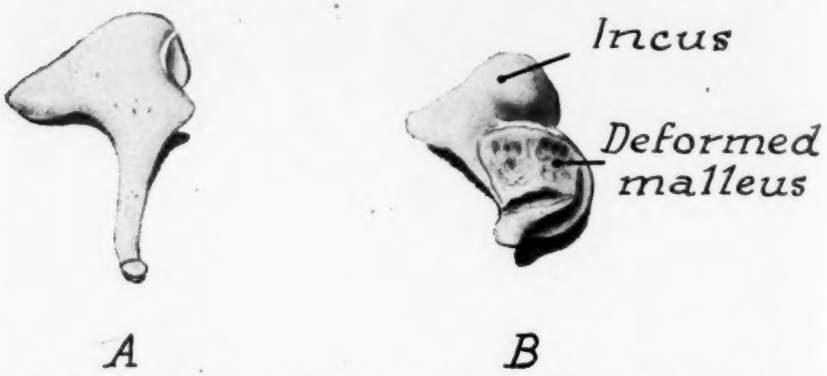

Fig. 5 (case 2).—*A*, drawing of a normal incus. *B*, drawing of the fused incus and malleus removed from the ear of patient R. C.

about his improved hearing: Before his operation when she would call the children, even though they were close at hand the younger brother would have to attract the patient's attention and bring him home. Now when the two boys are playing at the end of the lot, some 50 feet (15 meters) from the back porch, and

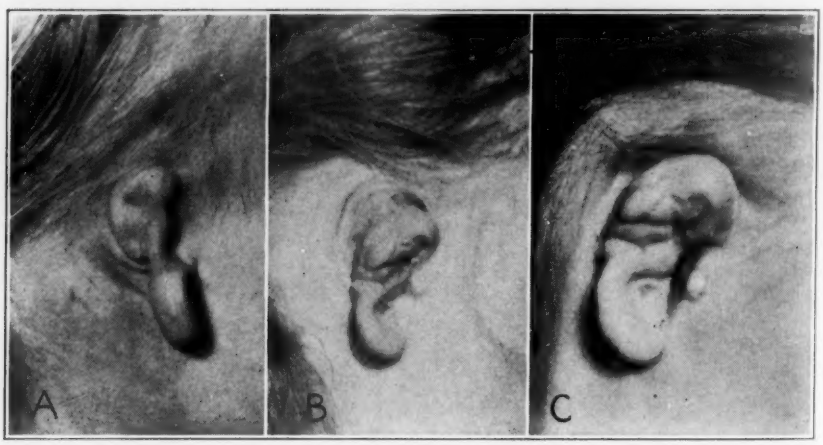

Fig. 6 (case 3).—*A*, shows the original congenital malformation; *B*, the way the auricle looked following several operations to reconstruct the auricle; *C*, the improvement in appearance following the formation of a meatus.

the mother calls, it is the patient who hears her and goes and gets the younger brother. There has been a decided improvement in his speech, and the younger brother no longer mimics the speech defects of the patient.

CASE 3.—S. L., a girl aged 14, had congenital atresia of the right auditory meatus with microtia. She had undergone plastic surgical operations to construct

an auricle but was not satisfied with the result because of the lack of a meatus (fig. 6 *A* and *B*).

According to her audiogram (fig. 7), there was normal hearing in the left ear. There was an average loss of 62 decibels in the critical speech frequencies in the right ear. The hearing graph with masking coincided with the graph without masking, showing that it was not a shadow curve. Bone conduction on the right side was normal. In the Weber test sound was lateralized to the right. The Rinne test gave a negative result for the right ear and positive result for the left ear.

On July 26, 1946 she was operated on and the incus was removed. The malleus was not seen. Most of the deformity of the incus in this patient was in the long process, but the short process was also thickened and shortened. A split skin graft was held in place with a wet cotton packing, removed on the seventh day. The graft was in good condition, and healing occurred without complications.

The postoperative audiogram (fig. 7) revealed an average loss of 38 decibels in the critical speech frequencies at the end of four months. Although she can hear

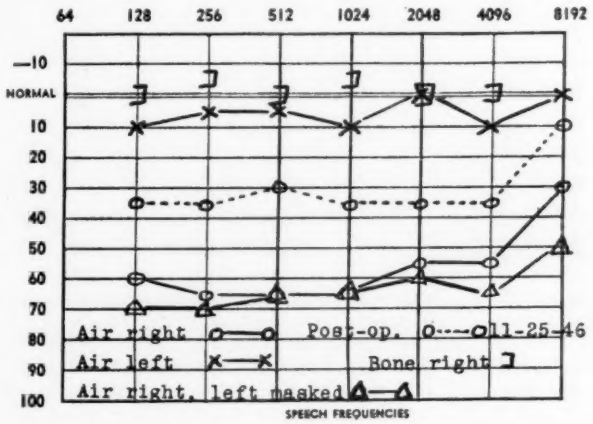

Fig. 7 (case 3).—Audiogram taken July 26, 1946, showing the improvement in hearing four months after operation.

and repeat a whisper in the ear operated on at 2 feet (61 cm.), she says that she does not realize whether she hears normal conversation in that ear or not because the hearing in the normal ear is so much better.

The appearance of the ear has been improved by the addition of a meatus to the reconstructed auricle (fig. 6 *C*). In spite of the improvement she is not satisfied and keeps her hair combed over the ear so that it will not show.

CASE 4.—D. C., a boy aged 9, had congenital atresia of the left auditory meatus with marked microtia and hemiatrophy of the face on the involved side (fig. 8 *A*). At birth there were multiple small pieces of subcutaneous cartilage (supernumerary auricles) around the face and neck, which later were removed. There was a hearing loss in the good ear as well as in the malformed ear. As a result there was a bad defect of speech.

Audiometric studies were satisfactory (fig. 9). The right (normal ear) had an average loss of 35 decibels in the critical speech frequencies. There was an average loss of 70 decibels in the same frequencies in the left (malformed) ear,

and this loss was checked by masking to show that it was a normal reading and not a shadow curve. Bone conduction was normal in both ears. In the Weber test sound was lateralized to the malformed ear. The Rinne test gave a positive result for the normal ear and a negative result for the deformed ear.

On July 26, 1946 the left ear was operated on. Since the ear was so far forward as to overlie the temporomandibular joint, it was difficult to determine just where

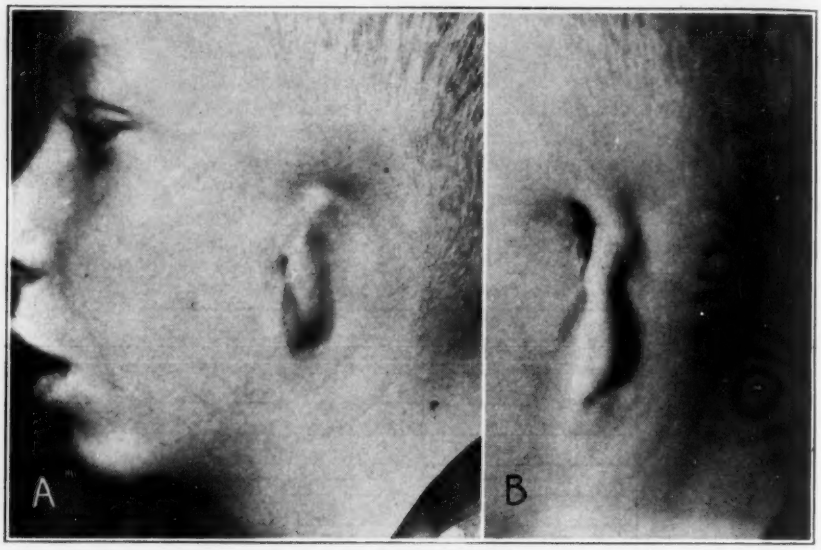

Fig. 8 (case 4).—*A* and *B*, preoperative and postoperative photographs. This boy had hemiatrophy of the face on the involved side. As a result, the auricle was forward over the temporomandibular joint. In an attempt to save all of the cartilage possible, the incision was made too far forward, with the result that the canal slants backward and the cosmetic result is not good.

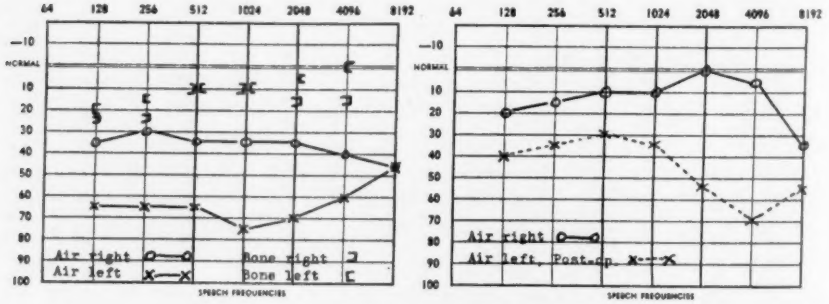

Fig. 9 (case 4).—On the left is the preoperative audiogram showing a loss of hearing in both ears. The improvement four months after the left ear was operated on is shown on the right. The improvement in the hearing of the right (normal) ear is accounted for by the clearing up of chronic sinusitis and post-nasal infection.

to make the incision. It was made too far forward in an attempt to utilize the small portion of microtic auricle that was present. As a result, the canal slants

backward and remains slit shaped rather than circular. The antrum was found and the incus uncovered. The short process of the incus was thin, and when it was being removed it was dropped and lost, so that I do not know whether the malleus was attached or not. The split skin graft was held in place by a wet cotton packing, which was removed on the seventh day. The graft was in good condition. At the time the packing was removed he could hear and repeat a low whisper at 1 foot (30 cm.). Three weeks after operation, otitis media developed, perhaps due to chronic sinusitis, and the drainage from the middle ear caused granulation tissue to form, which occluded the proximal third of the new auditory canal.

After the otitis media had healed and the granulation tissue had subsided, the canal opened up but has not been as large as those in the other cases owing to the backward slant previously described (fig. 8*B*). Treatment to clear up the nasal condition has resulted in improvement of hearing in both ears. Four months after surgical intervention, the hearing in the good ear has returned almost to normal, and that in the ear operated on has improved to an average loss of 40 decibels in the critical speech frequencies (fig. 9). His speech defect is improving with special speech instruction. His teacher reports marked improvement in his school work.

SUMMARY AND CONCLUSIONS

A review is made of the embryonal development of the ear and of the disturbances of development which lead to the deformity of congenital atresia of the auditory canal with microtia. The literature dealing with attempted surgical corrections of the condition is reviewed. Previous attempts to restore hearing have on the whole been unsuccessful, and consequently operative intervention has fallen into disrepute. No reports have been made since the endaural approach and the fenestration technic made possible advances in the surgical treatment of the mastoid process.

A review of the embryology of congenital atresia of the external auditory canal and a study of the audiograms of patients with this deformity led me to the conclusion that the deafness was due to a fixation of the stapes caused by its articulation with the deformed incus and malleus, which, in turn, were fixed to the bony plate replacing the membrana tympani. I reasoned that if this conclusion was correct, removing the incus would result in free movement of the stapes and improvement of hearing. The improvement in hearing should be of about the same degree as that obtained in fenestration operations.

An endaural mastoidectomy is described which does improve hearing as anticipated and also improves the appearance of the ear by forming a patent meatus. A report of 5 cases is included in which the operation was performed, with good results in 4 of the 5 ears and improvement in the fifth.

From this study I have reached the following conclusions about the indications for the operation:

1. The operation is advisable in cases of bilateral deformity.

2. In cases of unilateral defect the improvement of hearing is not sufficient to warrant the operation if the hearing in the normal ear is normal. However, the improvement of personality accompanying both the cosmetic and the hearing improvement seems to justify the operation. The cosmetic benefit is more important in boys than in girls, since the latter can hide the deformed ear by proper hair dressing.

3. In any case operation should be postponed until there is evidence that some hearing is present.

612 Republic Building.

Case Reports

ADENOCARCINOMA OF THE ETHMOID SINUS

FREDERICK T. MUNSON, M.D.,* and HENRY T. E. MUNSON, M.D., DETROIT

CANCER in the ethmoid labyrinth is usually "bad news" to the practicing otolaryngologist. Almost invariably the malignant cells involve vital adjacent structures before a diagnosis can be made. The early symptoms of nasal obstruction and postnasal discharge can be easily attributed to benign involvements of the nose.

Although pain is present in many cases, it is rarely sharp or distinctive until the later stages, and is localized usually in the area of the nasal processes of the frontal bones. It should be remembered that carcinoma of the ethmoid sinuses often spreads rapidly, extending directly to contiguous sinuses, and that the exact point of origin cannot, therefore, always be determined. Ringertz [1] pointed out that in 30 per cent of all cases of ethmoid carcinoma (55 per cent of the cylindric cell type) the disease is associated with polyposis of the nose. One can readily see, therefore, that neglect can easily allow the condition to become inoperable.

The tumors occurring in the ethmoid sinus include fibroma, osteoma, meningioma, ganglioneuroma and carcinoma. The carcinomas of this region are of three main types, the squamous cell, the cylindric cell (adenocarcinoma) and the various intermediate and undifferentiated types. Adenocarcinoma is a malignant tumor which may grow from any mucosa in which the epithelium is of the cylindric cell type, also from glands and ducts having cylindric cells in their lining. It may truly be called cylindric cell cancer. It is the malignant counterpart of the benign adenoma, occurrence of which in the ethmoid sinus is almost unknown.

Adenocarcinoma is distinctly uncommon in the nasal cavity and the accessory sinuses (Ellis).[2] In a detailed study of 127 cases of primary cancer originating in one of the paranasal sinuses Watson [3] found that 89 per cent were of the squamous type, while only 9 per cent were of the cylindric cell type. New [4] found only 6 adenocarcinomas in a series of 91 cancers of paranasal sinuses.

We should like to present our observations on an adenocarcinoma of the ethmoid sinus, encountered unexpectedly in the course of an

* Formerly of Blain Hospital.

From the Department of Otolaryngology, Riverside Clinic.

1. Ringertz, cited by Ewing, J.: Neoplastic Diseases: A Treatise on Tumors, ed. 4, Philadelphia, W. B. Saunders Company, 1940.

2. Ellis, B. E.: An Unusual Intranasal Tumor, J. Indiana M. A. **36**:147-148 (March) 1943.

3. Watson, W. L.: Cancer of the Paranasal Sinuses, Laryngoscope **52**:22-42 (Jan.) 1942.

4. New, G.: Malignant Diseases of the Sinuses, Am. J. Surg. **42**:117, 1938.

exploratory Caldwell-Luc operation, the prognosis of which appears to be favorable at this time.

REPORT OF A CASE

A. M., a white woman aged 49, was first seen on Aug. 3, 1944. She complained of nasal obstruction and a postnasal discharge which had been present over a period of twelve months, with a marked increase in these symptoms during the months of June and July 1944. There had been no pain.

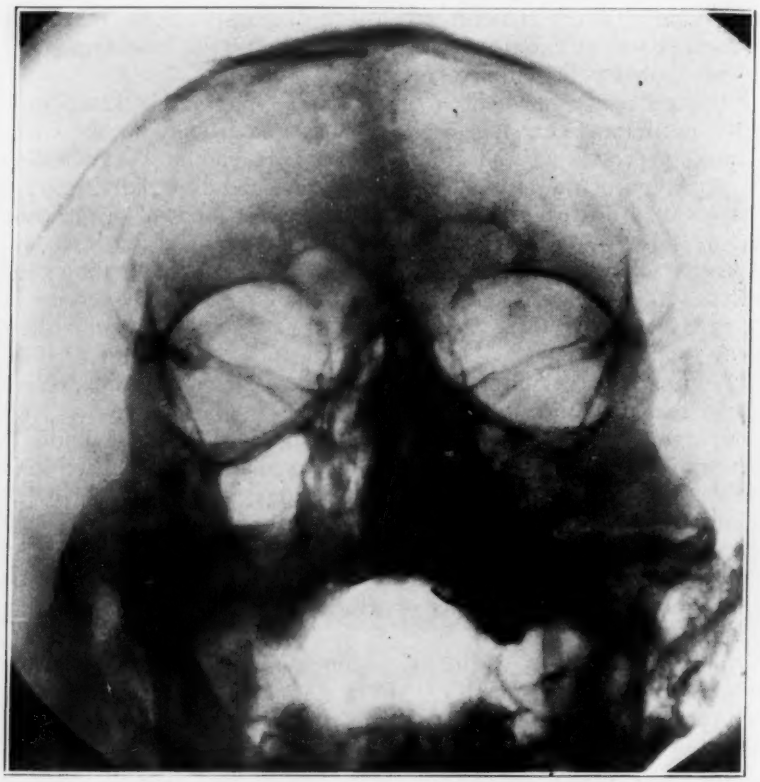

Fig. 1.—Roentgenogram showing pansinusitis of the left side, including opacity of the left nasal cavity.

She gave a history of a polypectomy performed in December 1943, three months after the noting of her first nasal symptoms. Her past history and the history of her family were essentially unrelated to the case. Tonsillectomy and adenoidectomy had been performed in 1920.

Physical examination revealed a large, robust, obese woman weighing 186 pounds (84.5 Kg.). She was moderately apprehensive and nervous. The general examination showed essentially normal conditions, the pulse rate, temperature and blood pressure being well within normal limits. There was a foul-smelling purulent exudate filling the left middle and lower meatuses, with much polypoid tissue evident in the region of the left middle turbinate. The left maxillary and

frontal sinuses were dark to transillumination and roentgen studies demonstrated pansinusitis on the left. A roentgenogram of the chest revealed a moderate amount of chronic bronchitis on the left side.

A diagnosis of chronic suppurative pansinusitis on the left side was made, and the patient was advised to undergo a radical Caldwell-Luc operation. This was performed on Aug. 18, 1944, and friable, fungating, moderately vascular tumor masses were removed from the region of the left ethmoid labyrinth. There was no demonstrable neoplasm inside the maxillary sinus. It was evident that com-

Fig. 2.—Section of tissue from the ethmoid region showing adenocarcinoma of grade 3.

plete removal of the tissue suspected of being cancer invaded would be impossible through the Caldwell-Luc approach, so it was decided to perform the external operation at another time should pathologic section prove the tissue to be cancerous.

Microscopic studies of the tumor masses revealed the presence of a poorly differentiated adenocarcinoma, grade 3 (fig. 2). On August 25, one week after the first operation, an external frontosphenoethmoid exploration was carried out on the left side after anesthesia had been induced by intravenous injection of pentothal sodium.

The fungating tumor tissue was fairly well localized to the left ethmoid region but was spreading somewhat toward the sphenoid and maxillary sinuses. All the tissues were carefully explored and cleaned out as thoroughly as possible. Curettage was supplemented with surgical diathermy in an effort to remove all tissue suspected of being cancerous. Both the inferior and the middle turbinate of the left side were completely removed, as was the anterior wall of the sphenoid sinus. There was no demonstrable bony erosion.

On Oct. 18, 1945, a biopsy was made of a tissue specimen taken from the superior portion of the left middle fossa. This tissue failed to show any evidence of cancer.

The patient has been followed closely over the thirty-one month period since the time of operation, and so far there has been no sign of recurrence.

Because of the radioresistance of this type of carcinoma and its localization to the ethmoid labyrinth, radium and roentgen therapy were not used.

Watson [3] has emphasized the point that a small, localized cancer of a paranasal sinus is an extremely rare finding and that it is usually encountered during a procedure for benign sinusitis.

This was the situation in the case described in the foregoing section and also in a similar case the history of which was presented by Ellis.[2] The presenting clinical abnormality in both patients was nasal polyps, and the cancer was undiagnosed prior to operation in both instances.

Ellis stated that, "Adenocarcinomata are only slightly sensitive to irradiation, and the only cure that can be depended upon is a complete removal of the neoplastic tissue, preferably by electro-coagulation."

Kime [5] also highly recommended electrosurgery for cancer of the accessory sinuses and expressed the belief that the eye should be sacrificed if the orbital fat contains evidence of cancer.

We agree with Arons,[6] Watson [3] and Woodward and Archer [7] that irradiation should be combined with surgical excision in treating carcinoma of the maxillary antrums, as well as in that of advanced growths of any of the paranasal sinuses. We do feel, however, that electrosurgical removal is the treatment of choice for a carcinoma of the cylindric cell type localized to the ethmoid labyrinth.

CONCLUSIONS

1. The otolaryngologist should always be alert for neoplastic tissue, even though performing an apparently routine procedure.
2. A Caldwell-Luc operation combined with a nasal approach is not adequate for a radical exenteration of the ethmoid labyrinth.
3. Electrosurgery, through an external approach, is sufficient for a small, localized adenocarcinoma of the ethmoid sinus.

1987 East Jefferson Avenue.

---

5. Kime, E. N.: Electro-Surgery of Cancer of the Nasal Accessory Sinuses, Arch. Phys. Therapy **19**:155-157 (March) 1938.

6. Arons, I.: Neoplasms of the Antrum, Nasopharynx and Hard Palate, Laryngoscope **51**:61-76 (Jan.) 1941.

7. Woodward, F. D., and Archer, V. W.: The Results of Treatment of Malignant Tumors of the Larynx, Hypopharynx, Nasopharynx and Sinuses, Virginia M. Monthly **67**:751-755 (Dec.) 1940.

HEMANGIOMA OF THE ESOPHAGUS IN INFANCY

CHARLES F. FERGUSON, M.D.
Associate Visiting Otolaryngologist, Children's Hospital and Infants' Hospital, Senior Associate in Otolaryngology, Peter Bent Brigham Hospital, and Assistant in Otology, Harvard Medical School
and
LORYE E. HACKWORTH, M.D.
Assistant Resident in Surgery, Peter Bent Brigham Hospital
BOSTON

HEMANGIOMA of the esophagus in infancy must be extremely rare, and so far as we can determine, no such case has hitherto been reported. A careful search of the literature revealed that only 1 case of hemangioma of the esophagus had been reported; the patient was a 70 year old man. That case was reported by Vinson and Moore [1] in 1926; a patient with an esophageal hemangioma had been cured by local treatment with radium and partial resection of the esophagus. These authors stated that of 4,000 patients seen at the Mayo Clinic with a presenting complaint of dysphagia, only 3 were found to have a benign tumor of the esophagus. One had a myoma, one a lipoma, and the third a hemangioma. Thus, in general, any benign esophageal tumor is uncommon. In 1932 Patterson [2] reviewed the literature from 1717 to 1932 and found that during that period of well over two hundred years only 61 cases of benign esophageal tumor had been reported, and that the case of Vinson and Moore [1] was the only one of hemangioma. The other 60 cases were divided as follows:

Polyp	26	Fibroma	2
Papilloma	8	Epithelial cyst	3
Myoma	8	Dermoid cyst	1
Lipomyoma	1	Aberrant thyroid	1
Leiomyoma	6	Adenoma	2

In 1940 Glynn [3] reviewed the literature and added the following cases:

Lipoma	2	Benign giant cell tumor	1
Fibrolipoma	3	Adenoma	1
Polyp	5	Fibroma	2
Myxofibroma	1		

From the Ear, Nose and Throat Department, Children's Hospital and Infants' Hospital.

1. Vinson, P. P.; Moore, A. B., and Bowing, H. H.: Hemangioma of Esophagus: Report of Case, Am. J. M. Sc. **172**:416-418 (Sept. 1) 1926.

2. Patterson, E. J.: Benign Neoplasm of Esophagus: Report of Case of Myxofibroma, Ann. Otol., Rhin. & Laryng. **41**:942-950 (Sept.) 1932.

3. Glynn, L. E.: Large Pedunculated Fibroma of Esophagus, Brit. J. Surg. **27**:610-615 (Jan.) 1940.

He found no further cases of hemangioma. In 1933 Broders, Vinson and Davis [4] recorded a case of hemangioendothelioma of the esophagus. The patient was a 76 year old woman who had complained of substernal pain and dysphagia. On esophagoscopy a lesion was found, which had infiltrated the left side of the anterior wall of the esophagus. A biopsy was made and the clinical diagnosis confirmed. The only other known cases of hemangioendothelioma, recorded by Carrara [5] in 1910, was encountered at a postmortem examination.

For these reasons we feel that the case to be reported now should be of interest, not only because the diagnosis was proved by biopsy but because of the extremely young age of the patient. It is of interest, also, in that the presenting complaints were melena and hematemesis, with associated general physical underdevelopment due to secondary anemia which had been present since the patient was 10 days of age.

REPORT OF A CASE

A 7 month old boy was admitted to the Children's Hospital, Boston, for the first time on July 21, 1943, with a presenting complaint of melena and hematemesis. These symptoms he had shown since the age of 10 days. Two weeks before admission he began to vomit blood-streaked material, and five days before admission he vomited blood with large clots and passed bulky tarry stools. He was followed at home by his family physician, who had prescribed iron therapy and vitamin K. There had been no history of diarrhea; on the contrary the patient had been quite constipated most of his life, in spite of various changes of formula.

There was no history of the usual familial diseases. The patient was the only child of a 22 year old mother and a 27 year old father who were in good health. The mother's health had also been good during pregnancy. The baby was a full term infant, born during a normal delivery after an easy short labor. His birth weight was 6 pounds 5 ounces (2,863 Gm.). Two weeks later he weighed only 6 pounds 1 ounce (2,750 Gm.), and he failed to regain his birth weight for several weeks thereafter. He was breast fed for three weeks.

Physical examination revealed a small, underdeveloped 7 month old boy who appeared nearer 3 months of age. He weighed only 11 pounds 10 ounces (5,273 Gm.) on admission. Though fairly well nourished, active and alert, he was unable to sit up alone without support. Except for pallor, the skin was not abnormal, and there were no rashes, petechiae or areas of ecchymosis. The head was large, and the fontanel admitted 2 fingers. There was no increased tension, but the sutures were somewhat separated. The extraocular movements were all normal, and the pupils reacted equally and rapidly. They were round and regular. Except for pallor, the fundi showed nothing abnormal, and there were no areas of hemorrhage. Both tympanic membranes showed normal landmarks and were not inflamed, retracted, thickened or dull. There was no nasal discharge. The mucous membrane was pale, but the turbinates and the septum were normal. The nasal airway was good. There was no dilatation of vessels at Kiesselbach's

4. Broders, A. C.; Vinson, P. P., and Davis, P. L.: Hemangio-Endothelioma of Esophagus: Report of Case, Arch. Otolaryng. **18**:168-171 (Aug.) 1933.

5. Carrara, N.: Sopra un caso di emangioendotelioma perivascolare primitivo dell'esofago, Gazz. internaz. di med. **13**:117-121, 1910; cited by Broders and others.[4]

areas. The two lower incisors were present. The mucous membrane of the mouth was pale but free from ecchymoses and petechiae. The tonsils were not enlarged, and there was no evidence of infection or exudate. The heart was not enlarged; the sounds were of good quality, and there were no murmurs or thrills. The pulse was regular and full, and the rate was normal. The lungs were clear to auscultation and percussion. Respirations were rapid, but regular, and not labored. The chest expansion was equal and normal, and the bony thorax showed no gross abnormality. The liver, the kidneys and the spleen were not palpable, and there were no masses in the abdomen. The abdomen was not distended, and there was

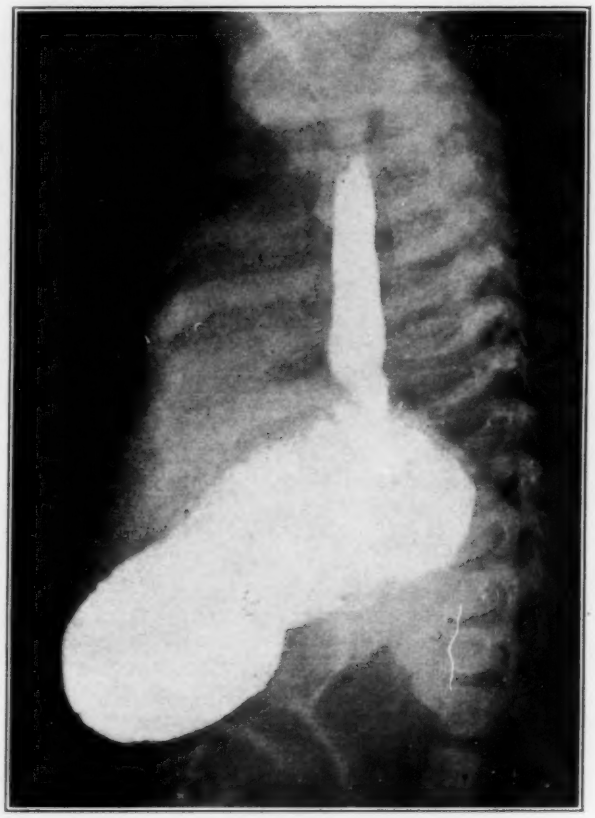

Fig. 1.—Roentgenogram of the chest of an infant with hemangioma of the lower quarter of the esophagus.

no tenderness, spasm or evidence of free fluid. Rectal examination with the finger produced no evidence of fresh blood, and no polyps or other masses were palpable. There were no fissures or fistulas. The extremities showed no weakness, paralysis or deformity. The reflexes were all equal and active; there were no abnormal reflexes.

The laboratory data were as follows: On admission the urine was clear and of p_H 7.5. Tests showed: albumin, 0; sugar, 0; acetone, 0; bile, 0; the sediment revealed no casts or cells. On admission the hemoglobin content was 5.7 Gm. (42 per cent). The red blood cell count showed 3,200,000 and 17,000 white cells,

with polymorphonuclear leukocytes 50, lymphocytes 45, monocytes 1 and eosinophils 4 per cent. The red cells showed hypochromia, anisocytosis and polychromatophilia. The blood smear showed normal platelets. The bleeding time was one minute; the capillary clotting time, four minutes; the prothrombin time, sixty seconds. The Hinton test of the blood was negative. An intradermal test with tuberculin 1:1,000 gave a negative result. The blood was shown to be of group O, and the red cells to contain the Rh factor. A guaiac test of the stool showed a 3 plus reaction; a guaiac test of vomitus, a 4 plus reaction.

The patient remained in the hospital for thirty-five days. During the first three weeks he frequently vomited "coffee ground" material and passed tarry stools. A series of gastrointestinal roentgenograms on the fourth hospital day

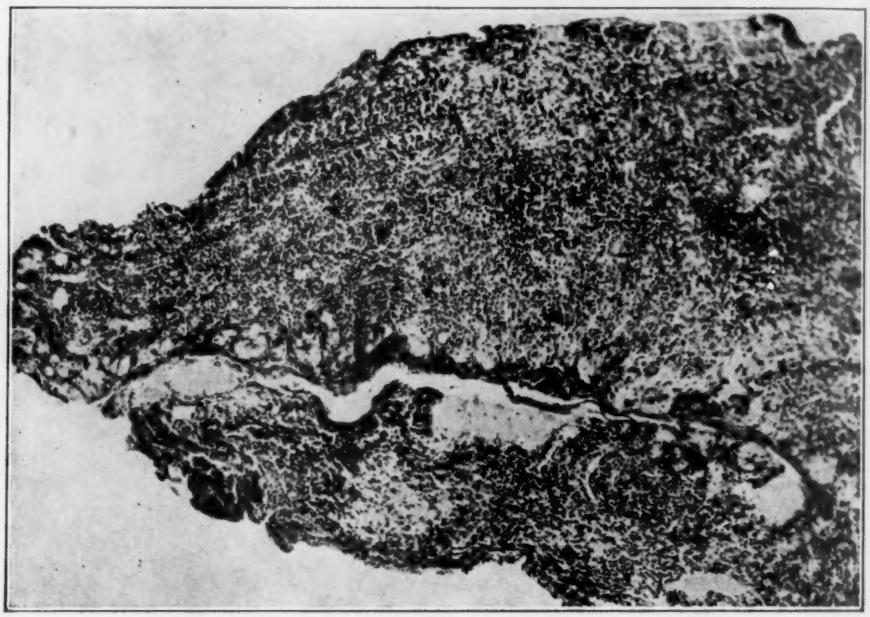

Fig. 2.—Low power view showing diffuse inflammatory infiltrate and numerous areas of degenerating collagen. × 97.5.

revealed "continuous relaxation (chalasia) of the cardiac end of the esophagus with a free flow of barium sulfate in and out of the stomach." Another barium sulfate examination of the esophagus and stomach on the ninth day revealed "a minute filling defect in the distal few centimeters of the esophagus with slight dilatation of the esophagus above this level" (fig. 1).

On the same day esophagoscopy was carried out by one of us (C. F. F.). Anesthesia was induced with ether, and a 5 mm. esophagoscope was passed. In the lower quarter of the esophagus there was active bleeding from a point on the left side of the anterior esophageal wall at about 9 to 10 o'clock. Because of the persistent bleeding, a satisfactory view of this area was not obtained, and further manipulation was postponed. Six days later esophagoscopy was performed a second time, and slight bleeding again was noted. However, in the region just described there was a small, slightly raised area of friable tissue which had the appearance of granulations. This tissue bled freely on being touched

with only a bronchoscopic sponge. There seemed to be no surrounding inflammatory reaction, and there were no areas of ulceration or ecchymosis. The tissue was removed and was observed to be pale pink and rather firm in consistency;

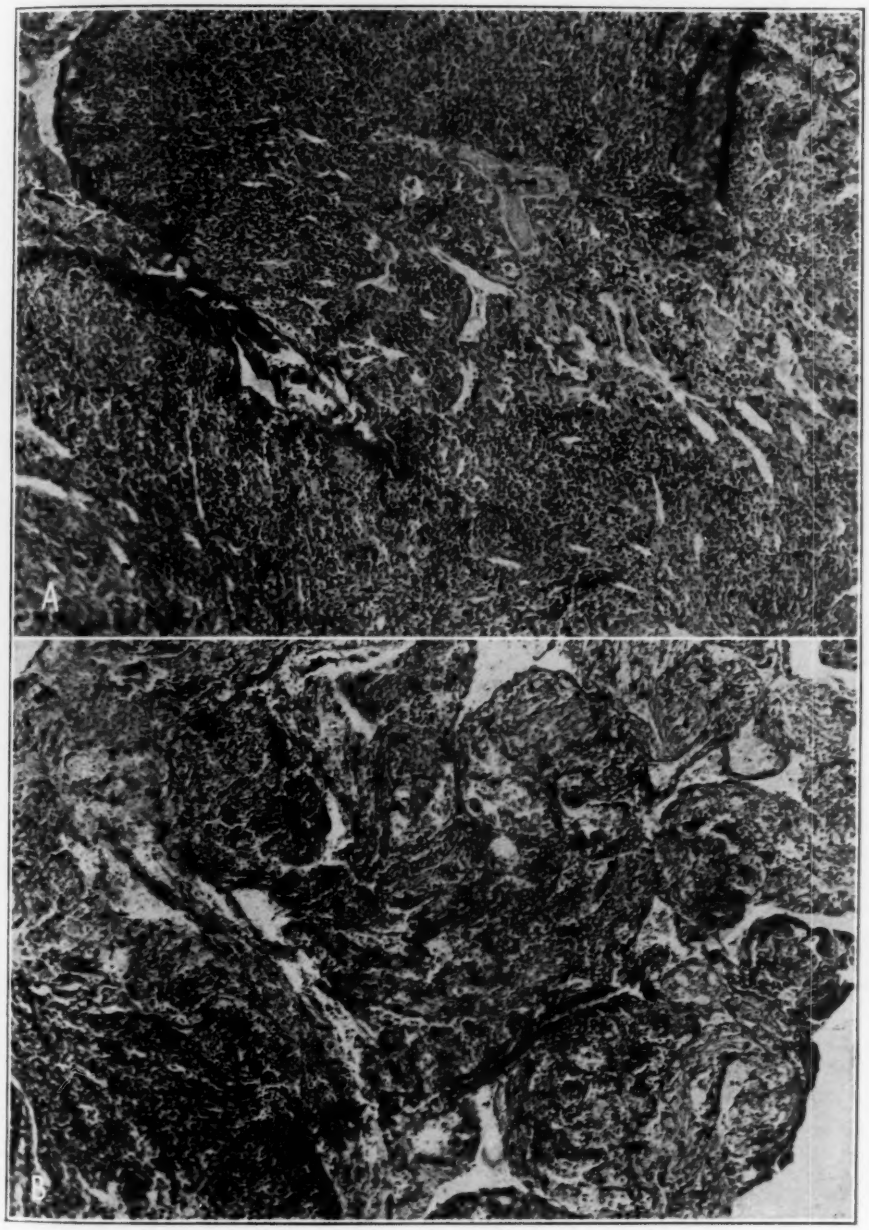

Fig. 3.—*A* shows massive diffuse inflammatory infiltrate, endothelium-lined spaces, some of which contain amorphous material, and a prominent area of degeneration of collagen. *B* shows well defined fibrous tissue stroma and numerous endothelium-lined spaces. × 97.5.

it measured 0.4 by 0.2 by 0.1 cm. The pathologic report follows: "On microscopic examination there is a well defined fibrous tissue stroma, in the interstices of which are seen many endothelium-lined spaces, some of which are filled with an

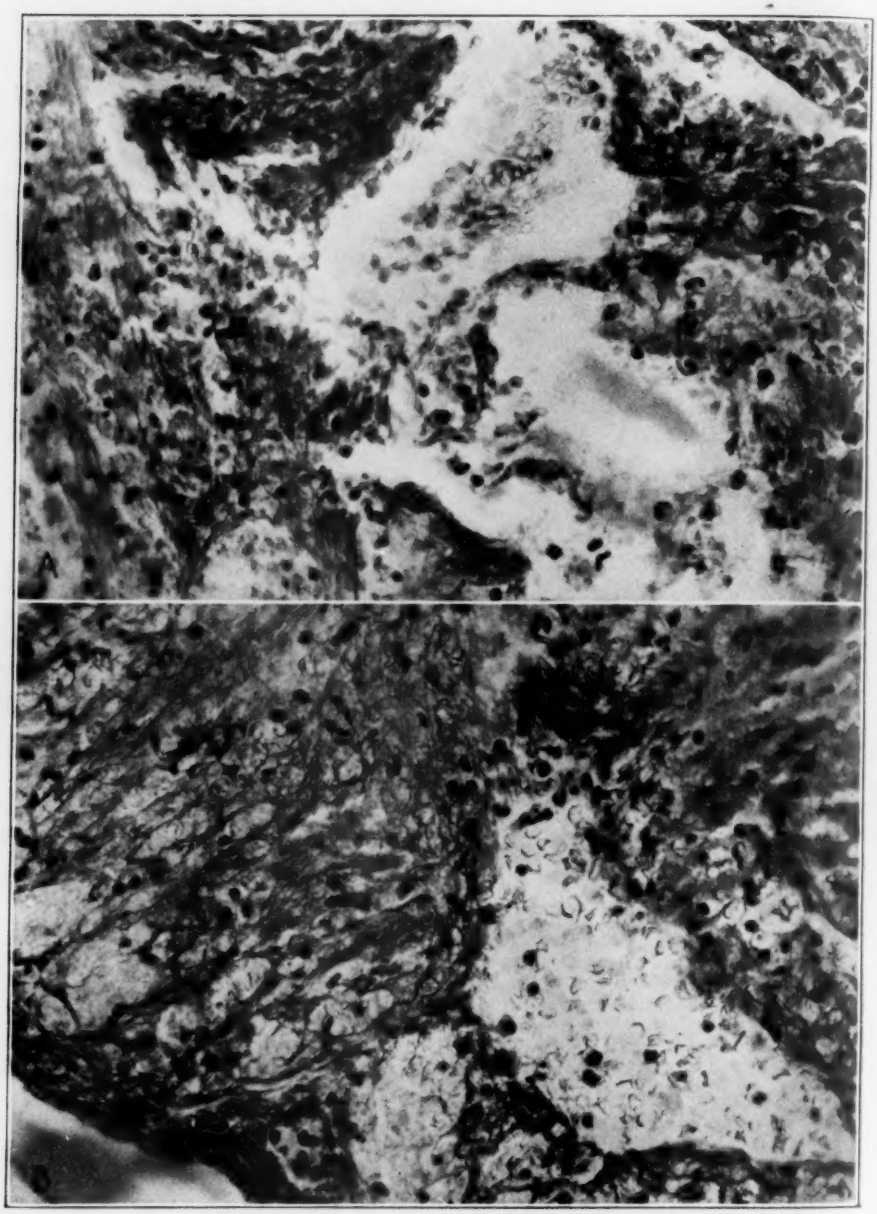

Fig. 4.—Prominent fibrous tissue stroma infiltrated by polymorphonuclear leukocytes and lymphocytes. In *A* the endothelium-lined spaces contain fresh blood. In *B* several areas of recent hemorrhage may be seen. Collagen is prominent. × 337.5.

amorphous neutrophilic precipitate. The stroma shows numerous areas of polymorphonuclear leukocytes and lymphocytes. A few areas of recent hemorrhage are seen. There is one small area, comprising less than one high power field, in which there is a cluster of pale cells resembling smaller endothelial cells. There are other areas of endothelial proliferation. Diagnosis: hemangioma." (The microscopic aspects are shown in figures 2 to 5.)

Postoperatively the patient was given two blood transfusions, although bleeding was not increased as a result of the surgical procedure. Within a few days evidence of pneumonitis developed, which responded satisfactorily to sulfadiazine therapy. On the twenty-seventh hospital day a five day course of roentgen treatments of the lower portion of the esophagus was begun. Daily 200 roentgens (r),

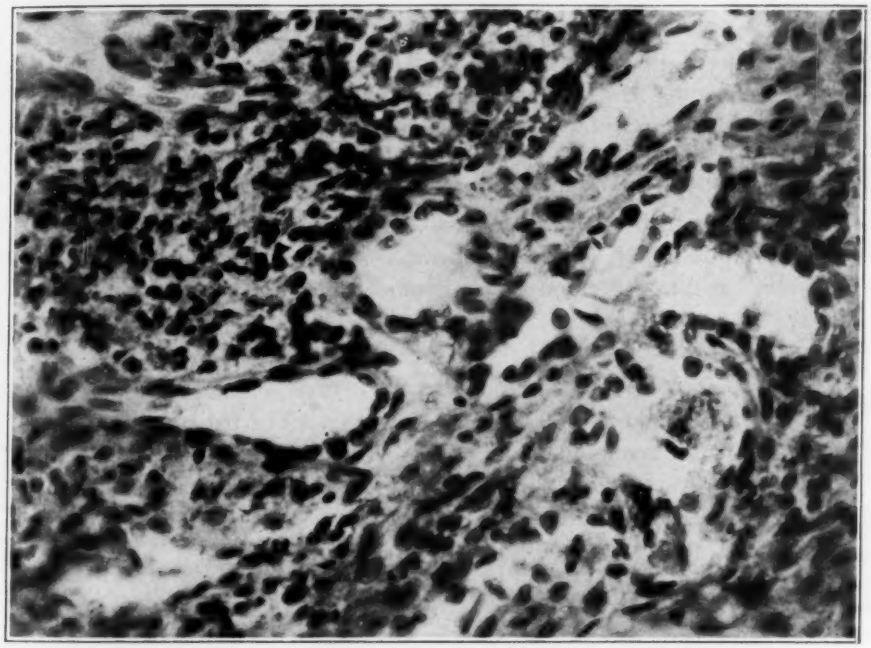

Fig. 5.—High power view showing infiltrate of polymorphonuclear leukocytes and lymphocytes. Note endothelium-lined spaces, one of which contains amorphous material. × 337.5.

measured in air, was given through a single posterior port measuring 5 by 10 cm., so placed as to cover the lower third of the esophagus and the cardiac end of the stomach. The following factors were employed: 200 kilovolts; 10 milliamperes; a 50 cm. target skin distance; a filter of 1 mm. of aluminum and 0.5 mm. of copper with a half value layer of 1.05 mm. of copper. The 200 r was administered in seven minutes twelve seconds. After five daily treatments he had no more vomiting and no recurrence of bleeding. The reaction of the stools to guaiac rapidly became negative, and the red cell count remained at 4,600,000, with hemoglobin 13.8 Gm. The patient's color improved remarkably. He was discharged to his home on the thirty-sixth hospital day, twenty-four days after the diagnosis was made and nine days after treatment was started.

Follow-up.—At the time of the last follow-up examination, Jan. 15, 1946, the patient was over 3 years of age. It was then over two and a half years since his roentgen treatments, and he had had no recurrence of his symptoms. Growth and development had been normal since treatment was instituted and the chronic loss of blood controlled. The stools have been tested with guaiac repeatedly and have always been negative. He has shown no tendency toward the development of anemia. Barium sulfate studies of the esophagus and stomach at the age of 2 showed a slight irregularity of the hiatal portion of the esophagus, but less marked than on the previous examination. Esophagoscopy was performed a third time when the boy was 2½ years old, on May 4, 1945, and at that time no evidence of recurrence could be found. On Jan. 15, 1946, when he was over 3 years old, roentgenograms and fluoroscopic studies of the esophagus with use of barium sulfate showed no evidence of spasm, filling defect or stenosis. The mucosal pattern showed nothing unusual.

This case is presented to call attention to the fact that hemangioma of the esophagus may account for hematemesis and melena even in an infant. The diagnosis was made when the child was 7 months of age, and removal of a biopsy specimen was performed by esophagoscopy. This patient also illustrates the effectiveness of radiation therapy of a hemangioma which is not approachable surgically. It also substantiates the observation that secondary anemia as a result of chronic loss of blood will lead to general underdevelopment in a patient at this early age.

SUMMARY

A 7 month old boy was found to have a hemangioma of the esophagus. The diagnosis was made by esophageal biopsy. The patient was treated with 1,000 r of roentgen radiation in divided doses. Two years later a follow-up revealed no evidence of tumor, and the patient had remained entirely free from symptoms.

The pathologic studies and photomicrographs are reproduced through the courtesy of Sidney Farber, M.D., pathologist of the Children's Hospital. Edward B. D. Neuhauser, M.D., was the roentgenologist under whose direction the roentgen studies and the roentgen treatment was carried out.

300 Longwood Avenue (Dr. Ferguson).

Clinical Notes; New Instruments and Technics

A PROCEDURE FOR INSTILLING PENICILLIN INTO THE ANTRUM

FRANK S. FORMAN, M.D., KANSAS CITY, MO.

THEN penicillin became available for clinical use, it appeared logical in cases of acute and subacute maxillary sinusitis to puncture the antrum for diagnosis, culture of contents, irrigation and local instillation of penicillin. Sale and Diamond,[1] in 1944, reported that they had used penicillin in the treatment of chronic suppurative maxillary sinusitis. Their technic was to leave spinal puncture needles in situ and instil penicillin every three hours for twenty-four hours. After following this method in several cases Dr. Graham Asher suggested that tubing could be used instead of a needle. It was felt that a tube, being flexible, would be more comfortable for the patient, because there would be no pressure on the vestibule, no danger of the needle's perforating the orbital plate on being struck during sleep or on some unthinking sudden move of the patient, and particularly no psychic trauma of the patient through having two long, large sharp needles in his nose.

The method is simple. After the antrum has been punctured with an antral needle or a spinal puncture needle of sufficient size, a small no. 4 ureteral catheter is passed through the needle so that 1 inch (2.5 cm.) or more protrudes from the distal end of the needle. The needle is then carefully withdrawn, the ureteral catheter being left in place. The most of the extranasal portion of the catheter is cut off, just enough being left to be taped to the face. The penicillin is injected through the catheter with a 26 gage hypodermic needle.

The patient tolerates this well. There is no discomfort, and there need be no limitation of the patient's activity other than that necessary to enable the penicillin to remain for a sufficient period in the antrum.

This procedure has been used with hospitalized patients as well as with outpatients for whom hospitalization was felt to be unnecessary, unwise or impossible.

This technic is advocated only for suppurative maxillary sinusitis, acute, subacute and in certain instances chronic. This treatment has given excellent results in these cases.

1110 Professional Building.

1. Sale, G., and Diamond, E. H.: Chronic Suppurative Maxillary Sinusitis Treated Locally with Penicillin by a New Method, Arch. Otolaryng. **40**:406 (Nov.) 1944.

Progress in Otolaryngology

Summaries of the Bibliographic Material Available in the Field of Otolaryngology

OTITIS MEDIA AND COMPLICATIONS

B. R. DYSART, M.D.
PASADENA, CALIF.

THE LITERATURE of 1945 is notable for the many articles concerning the use of penicillin. Several reports were made by men in the armed services who had large numbers of patients under observation. There is still difficulty in obtaining journals from abroad.

CHEMOTHERAPY

Christierson [1] reported on an unusually severe epidemic of otitis media which occurred in one of the naval training centers during the winter of 1943-1944. In 158 cases mastoidectomy was done, and in 29 there were grave complications. The patients received little help from the sulfonamide drugs but responded dramatically when penicillin was given. Complications included thrombosis of the lateral sinus in 10 cases, abscess of the brain in 1, facial paralysis in 3, otitic meningitis in 5, encephalitis in 2, labyrinthitis in 5 and erysipelas in 2. In 5 cases there was definite evidence of mastoiditis with roentgen evidence of destruction; in 1 of them this was extensive, and yet recovery occurred without surgical intervention when adequate doses of penicillin were given. One toxic reaction occurred; urticaria appeared in the third week of penicillin therapy but disappeared promptly when the use of this drug was discontinued. No deaths occurred in the series, but death occurred in 1 patient before he could be admitted to the hospital. He had been treated with sulfadiazine for acute otitis media for two weeks before death. The drum had healed and the patient seemed well. Severe headache suddenly developed, with convulsions and vomiting. Autopsy showed a healed drum, necrotic petrositis with adjacent localized meningitis, and massive cerebellar abscess.

Allman [2] reported on the use of penicillin in the treatment of otitis media occurring in 511 of 5,640 cases of scarlet fever. In 33, or 6.4 per cent, of the cases in which otitis media occurred mastoidectomy was

1. von Christierson, S.: Penicillin in Otitis Media, U. S. Nav. M. Bull. **45**:919-925 (Nov.) 1945.

2. Allman, C. H.: Penicillin in Otology, J. A. M. A. **129**:109-112 (Sept. 8) 1945.

required. "Not a single patient had paracentesis. I advise this procedure ordinarily, but conditions were such that it was impossible to do it." There were no deaths in the series, and all of the patients undergoing mastoidectomy recovered without chronic drainage of the involved ears. Two patients were admitted to the hospital with symptoms of meningitis. These cleared up rapidly with penicillin administered intrathecally and intramuscularly; simple mastoidectomy was done on both patients at the time of their admission.

Greenfield and co-workers [3] report on the intramuscular use of penicillin in 5 serious cases. In 3 patients definite mastoiditis, and in 1 of these, an infant of 3½ months, a large subperiosteal abscess cleared up without operation. Another patient had thrombosis of a cavernous sinus resulting from an infection of the skin at the edge of the nose. Penicillin and heparin were used. Positive blood cultures of the hemolytic streptococcus were obtained.

Weinstein [4] states that although the sulfonamide compounds have given good results in the treatment of acute otitis media, they still leave much to be desired. He treated 50 patients for acute otitis media with penicillin. In 48 per cent of these patients the otitis was a complication of scarlet fever. His results were excellent; 82 per cent of the patients were free from discharge in less than four and one half days. There was recurrence of discharge in 16 per cent, but larger doses were given and were effective. Only one mastoidectomy was done; phlebitis of the lateral sinus had developed. "There was no evidence of mastoid infection at the time of operation." Infections in which hemolytic Staphylococcus aureus was found were more resistant to penicillin but responded to larger doses.

Ball [5] reported 12 cases of acute otitis media complicating scarlet fever and 5 cases of nonscarlatinal otitis media. In all of these cases sulfadiazine was administered in large doses for six to forty-four days without improvement. When penicillin was given the otitis in all of them with one exception cleared up rapidly without mastoidectomy. Hearing became normal in an average of nine days. In 1 case of scarlatinal otitis media acute labyrinthitis developed after eighteen days of penicillin therapy, and simple mastoidectomy was done.

From the discharge of the ears of the patients with scarlatinal otitis media hemolytic streptococci were grown, and from that of the ears

3. Greenfield, S. D.; Kuritzky, I., and Jacobs, E. A.: The Use of Penicillin in Otorhinologic Infections, Laryngoscope **55**:20-27 (Jan.) 1945.

4. Weinstein, L.: Treatment of Acute Suppurative Otitis Media, J. A. M. A. **129**:503-508 (Oct. 13) 1945.

5. Ball, S.: Penicillin in Acute Otitis Media and Mastoiditis, Arch. Otolaryng. **41**:109-112 (Feb.) 1945.

of patients with nonscarlatinal otitis media staphylococci. In all of the cases with one exception roentgen changes were observed, ranging from clouding to early necrosis. [It would have been interesting to know how large a series of cases of otitis these 17 cases were taken from. As a rule the otitis media complicating scarlet fever responds well to sulfadiazine in adequate doses.]

Merica [6] used sulfathiazole or sulfanilamide in 75 mastoidectomy wounds with "no recurrence of local infection." He did not use a drain after simple mastoidectomy. In 10 of 11 cases of chronic otitis media with a large central perforation of the tympanic membrane the insufflation of sulfanilamide powder cleared up the disease in from one to six treatments.

He listed the number of cases in which mastoidectomy was done in three large hospitals in and near Cleveland during the years from 1937 to 1943. The number was 153 in 1937 and 35 in 1943—a reduction of four fifths in six years.

Rigg [7] reports on 824 cases of acute and subacute otitis media in which the sulfonamide drugs were administered. "Thirty per cent of these were purulent." Only 2 patients required mastoidectomy, and there was one death [whether the patient who died was treated by mastoidectomy is not mentioned; the disease was recorded as fulminating].

Putney [8] reported 10 serious cases of mastoiditis in which penicillin was used generally and locally in the mastoidectomy wound. In 6 of the patients thrombosis of the lateral sinus developed. One patient had cerebellar abscess, another had petrositis and meningitis, and another had extradural abscess and meningitis.

Eight of the patients had been treated with sulfonamide compounds without cure. All of the 10 patients improved rapidly on administration of penicillin, but it was necessary to do the usual surgical procedures before cure was obtained. One patient who had uncomplicated mastoiditis was treated with penicillin for twenty-one days, but the purulent discharge continued. Simple mastoidectomy showed gray necrotic tissue but no free pus.

He concluded that sterilization of the blood stream and control of spreading infections can be accomplished but that surgical intervention is usually necessary to effect a cure. Local application of the drug has proved beneficial in the healing of persistently draining mastoidectomy wounds.

---

6. Merica, F. W.: Local Use of Sulfonamide Compounds in Surgical Treatment of the Ear, Arch. Otolaryng. **41**:133-136 (Feb.) 1945.

7. Rigg, J. P.: Rational Therapy in Acute Otitis Media, Arch. Otolaryng. **41**:137-139 (Feb.) 1945.

8. Putney, F. J.: Penicillin in Mastoiditis and Its Complications, Arch. Otolaryng. **41**:247-251 (April) 1946.

Woodward and Holt [9] tried the local use of penicillin solutions in treating acute and chronic otitis media. No improvement above that expected without treatment was noted in the cases of acute infection. In the cases of chronic infection disappearance of the odor was noted, but the percentage cured was not high.

Burtoff [10] used sulfathiazole locally in mastoidectomy wounds and preoperatively in some cases of chronic otitis media. In 30 cases mastoidectomy was done, and all the patients recovered rapidly and without complications. The length of hospitalization was reduced. In the cases of chronic otitis media the preoperative use of the drug was disappointing; in not 1 case was the disease cleared up by the local use of this drug.

Mothersill [11] reviews the literature on penicillin to date and gives general indications for its use.

Falbe-Hansen and Becker-Christensen [12] report their experiences with 658 cases of otitis media. Most of the patients were children. The authors included cases with a duration of otitis of less than four days. Three hundred and twenty-three patients were used as controls. Three hundred and thirty-five were treated with sulfonamide compounds. The "discharging period" of otitis media produced by hemolytic streptococci, pneumococci and Pfeiffer's bacillus was lowered 45, 26 and 41 per cent, respectively. Better results were obtained when the treatments were started within forty-eight hours after onset of the disease. The percentage requiring mastoidectomy was lowered from 9.3 to 1.5. [This is a well controlled study.]

Among other methods of using penicillin Struble [13] has recently been dusting 100,000 units of penicillin powder into the mastoid cavity just prior to closure with drainage. This shortens the period of drainage. In postoperative care of the cavity resulting from a radical mastoidectomy he has used gauze packing saturated with a solution of penicillin, 2,500 units per cubic centimeter, and then squeezed dry.

Johnson, Weinstein and Spence [14] reported 23 cases of surgical mastoiditis in which primary suture of the wound was done. A small

9. Woodward, F. D., and Holt, T.: Local Use of Penicillin in Infections of the Ear, Nose and Throat. J. A. M. A. **129**:589-592 (Oct. 27) 1945.

10. Burtoff, S. B.: Local Use of Sulfathiazole in Mastoidectomy Wounds, Arch. Otolaryng. **42**:6-13 (July) 1945.

11. Mothersill, M. H.: Penicillin and the Infections of the Ear, Nose and Throat, Ann. Otol., Rhin. & Laryng. **54**:166-174 (March) 1945.

12. Falbe-Hansen, D., and Becker-Christensen, P.: On Sulfonamide Therapy in Acute Suppurative Otitis Media with Special Reference to Otitis in Children, Acta oto-laryng. **32**:209-220 (June 30) 1944.

13. Struble, G. C.: Penicillin Therapy in the Practice of Otolaryngology, Arch. Otolaryng. **42**:327-339 (Nov.-Dec.) 1945.

14. Johnson, L. F.; Weinstein, L., and Spence, P. S.: Penicillin and Primary Suture in Acute Surgical Mastoiditis, Tr. Am. Acad. Ophth. (1944) **49**:319-325 (July-Aug.) 1945.

no. 4 or 5 urethral catheter was stitched into the upper angle of the wound and the wound closed tightly. He closed the wound with two layers of sutures in an attempt to obtain a water-tight closure. The dose of penicillin finally decided on, after trial of smaller amounts, was 10,000 units, given in 2 cc. of isotonic solution of sodium chloride every eight hours for four days. The catheter was plugged with a sterile phonograph needle after each dose was given. Fifteen patients were treated by this technic, and all had dry ears when the catheter and the sutures were removed on the fourth postoperative day. One boy, who had measles, noted recurrence of drainage from the ear fifteen days afterward. The catheter was inserted through a small incision made at the top of the wound and penicillin administered for another five days. He remained well after this. [This seems preferable to the procedure of instilling sulfonamide compounds in mastoidectomy wounds, since occasional toxic reactions have been reported following the use of the sulfonamide drugs in mastoidectomy wounds.]

[From the evidence in several of the articles cited it is definite that otologists can hope to clear up acute mastoiditis with penicillin in a certain percentage of cases even if the roentgen examination shows definite destruction. Therefore, if there are no signs of impending intracranial extension, the patient may be offered the hope that a thorough course of penicillin therapy may be effective, whereas the otologist in the past would have insisted on immediate operation.]

ACUTE OTITIS MEDIA AND MASTOIDITIS

Wright [15] reports 39 cases of purulent otitis media developing after aero-otitis media. The patients were observed in a large aviation training center where about 150,000 flights were made. In most of the cases inflamed adenoid tissue was found in the nasopharynx. Treatment by roentgen ray or radium was found to be satisfactory. The age group was 18 to 27.

[Other authors writing on aero-otitis have stated that the danger of suppurative otitis media in flying is nil. It is true that infections are rare, but the reviewer has seen several cases of suppurative otitis media resulting from civilian flying.]

CHRONIC OTITIS MEDIA AND MASTOIDITIS

Boies [16] defines chronic otitis media as

> . . . a continued suppuration from the middle ear following an acute necrotic otitis media or a primary suppuration in a middle ear with hyperplastic mucosa;

15. Wright, W. R.: Aero-Otitis Media, Ann. Otol., Rhin. & Laryng. **54**:499-512 (Sept.) 1945.

16. Boies, L. R.: Chronic Suppurative Otitis Media, Ann. Otol., Rhin. & Laryng. **54**:265-283 (June) 1945.

uncommonly it occurs following an invagination of epithelium from Shrapnell's membrane to form a cholesteatoma without pre-existing perforation, or an ordinary otitis media in a previously normal middle ear.

The necrotic type of acute otitis media is apt to occur with scarlet fever, measles or diphtheria. He emphasizes that the element of time should not be considered as important as the pathologic lesion. The classification of Lillie is recommended, as follows: type I, cases in which there is an odorless thin mucoid discharge with a central perforation of the tympanic membrane, the discharge coming chiefly from the eustachian tube; type II, cases in which there is a large central perforation with much hyperplasia of the mucous membrane of the middle ear and no disease of the attic; type III, cases in which there is involvement of the attic with cholesteatoma usually present, and type IV, cases in which the infection has extended to the labyrinth, the meninges, the brain or the facial nerve. Boies has used the endaural approach in 82 cases of chronic otitis media and considers it superior to the postaural incision.

Williams [17] reviews in a general way the subject of chronic otitis media and advises that powdered sulfonamide compounds be used in the middle ear after careful cleansing of the ear. He has found its use satisfactory.

Birrell [18] reports that while many soldiers who had "safe" chronic otitis media were kept from oversea services, many with "unsafe" ears were encountered in Italy and North Africa. The diagnostic points of marginal perforation, attic perforation, character of discharge, etc., are carefully discussed. Of 1,702 patients with aural diseases seen in the ear, nose and throat department of a general hospital, about 10 per cent were "unsafe" and should not have been allowed in the Army.

THROMBOSIS OF THE LATERAL SINUS

Rosenwasser [19] reviews the literature on thrombosis of the lateral sinus and reports 100 cases. The mortality was 27 per cent. He properly included several cases in which meningitis or abscess of the brain was noted on admission. [Only 19 of the 100 patients received chemotherapy; therefore, it is assumed that the series extended back before the days of chemotherapy, dates not being given.]

Collins [20] observed retrograde thrombosis of the lateral sinus extending into the transverse sinus, the straight sinus and the inferior

17. Williams, H. J.: Chronic Suppurative Otitis Media, Pennsylvania M. J. **48**:1159-1161 (Aug.) 1945.

18. Birrell, J. F.: The Unsafe Ear, Edinburgh M. J. **52**:213-218 (June) 1945.

19. Rosenwasser, H.: Thrombophlebitis of the Lateral Sinus, Arch. Otolaryng. **41**:117-132 (Feb.) 1945.

20. Collins, E. G.: Unusual Intracranial Complications of Otitic Origin: Report of Three Cases, J. Laryng. & Otol. **60**:56-67 (Feb.) 1945.

longitudinal sinus. In spite of sulfapyridine and surgical opening of the lateral sinus, the patient died. The author states that in a similar case he would follow the thrombus back farther. In his second case the lateral sinus ruptured spontaneously into the mastoidectomy wound. The rupture occurred ten days after operation. The hemorrhage was severe. The patient recovered after packing of the lateral sinus and administration of large doses of sulfonamide compounds. The third case was one of Bacillus proteus septicemia with left temporosphenoidal abscess of the brain, which ended fatally in spite of surgical drainage of the abscess and administration of large doses of sulfonamide compounds.

Birrell [21] reports a case of thrombosis of the lateral sinus in which a pure culture of B. proteus was obtained. The blood cultures were negative. Operation was done, and the patient recovered. Credit for the recovery was given to the fact that the organism did not gain entrance to the blood stream rather than to the penicillin and sulfonamide compounds.

LABYRINTHITIS

Jones [22] reports in detail 3 cases in which labyrinthine symptoms of vertigo, nausea, vomiting, ataxia and nystagmus were present. In these cases and 22 others in which the symptoms were similar, the labyrinth was operated on through the endaural approach. He found that he could "reach cells in the petrous part of the temporal bone which were inaccessible through the posterior approach." He states that "patients with symptoms indicating inflammatory labyrinthine involvement other than diffuse suppurative labyrinthitis should not have an operation on the labyrinth until a method of removing perilabyrinthine cells has been tried." He states that the rotation test was of little value in obtaining information as to perilabyrinthitis. The caloric test is of value in eliminating the labyrinth that does not respond. Because of long experience with labyrinthitis, he is not so sure of his diagnosis as he once was. His operative findings have not always agreed with his preoperative diagnosis.

Tamari and Hirsch [23] advise a minimum of two or three weeks' rest in bed before operation in cases of labyrinthitis. Radical mastoidectomy is always done. The positive fistula test does not require verification at operation, as the perforation of the labyrinth may be microscopic. Manipulations of the middle ear of any kind are advised against.

---

21. Birrell, J. F.: A Case of Lateral Sinus Thrombosis Due to Bacillus Proteus with Recovery, J. Laryng. & Otol. **60**:85-89 (Feb.) 1945.

22. Jones, M. F.: Disturbed Vestibular Function, Arch. Otolaryng. **41**:272-277 (April) 1945.

23. Tamari, M., and Hirsch, L.: Management of Chronic Middle Ear Suppuration with Fistula, Ann. Otol., Rhin. & Laryng. **54**:349-357 (June) 1945.

Abstracts of cases seen in three years were given. In the discussion following the presentation of this report at the state section meeting in May 1944 in Chicago Dr. Alfred Lewy stated that he insisted on six to eight weeks' rest in bed before operation since several times he had operated earlier and stormy convalescence was the result.

Altmann and Waltner [24] report the case of a woman 43 years of age in whom the stapes was fractured and dislocated either when the middle ear was being curetted during radical mastoidectomy or while the cavity was being packed too tightly with gauze. The injury was not observed at operation but was found in the sections made of the temporal bone at autopsy. Death resulted from meningitis. The case was observed before chemotherapy was available.

Altmann and Waltner [25] report 5 cases of labyrinthitis, all of them fatal. Histologic sections of the temporal bones showed that in 1 case the involvement of the labyrinth occurred by invasion of the semicircular canals and in the other 4 by invasion of one or both of the windows. The causative organism in each case was the hemolytic streptococcus. Exudative inflammations tend to penetrate through the windows and proliferative infections (Pneumococcus type III and chronic infections complicated with cholesteatoma) through the osseous capsule, especially through the semicircular canals. All of these cases were observed before chemotherapy became known. With its help the management of labyrinthitis has become a different problem. The illustrations are excellent.

Van Egmond and Jongkees [26] report 53 cases of labyrinthitis seen at Utrecht, Netherlands, during the period 1930 to 1940. Radical mastoidectomy was preferably done after all symptoms had subsided. Operation on the labyrinth itself was to be considered only if symptoms of meningitis were seen. Prolonged rest in bed is essential. Recovery occurred without complications in all 36 cases of labyrinthitis except 1, in which meningitis developed.

PETROSITIS

Watkyn-Thomas,[27] speaking of labyrinthitis and petrositis in the course of discussion of endocranial complications of otitic origin at the Royal Society of Medicine in England, stated that in operating for

24. Altmann, F., and Waltner, J. G.: Slight Operative Injuries of the Stapes, Arch. Otolaryng. **42**:42-47 (July) 1945.

25. Altmann, F., and Waltner, J. G.: Labyrinthitis Following Purulent Infection of the Middle Ear, Arch. Otolaryng. **42**:93-110 (Aug.) 1945.

26. Van Egmond, A. A., and Jongkees, L. B. W.: Inflammations of the Internal Ear Following Inflammation of the Middle Ear (Otogenous Labyrinthitis), Acta oto-laryng. **32**:1-39 (Jan.-Feb.) 1944.

27. Watkyn-Thomas, F. W., in Symposium on Endocranial Complications of Otitic Origin, J. Laryng. & Otol. **60**:129-143 (March) 1945.

petrositis he usually found the infected area by following a track of pus wherever this presented itself. If there was no lead, he preferred to operate by the Voss-Ruttin-Eagleton method. He considered the Almour-Kopetsky approach "an anatomical exercise."

ABSCESS OF THE BRAIN

Hutchinson [28] summarizes the symptoms, the differential diagnosis, the course and the treatment of the different varieties of brain abscess. He purposely omits chemotherapy but is certain of its usefulness. His article should be read in the original.

Davis,[29] who also participated in the discussion of endocranial complications at the meeting of the Royal Society of Medicine in England, advised opening the temporosphenoidal lobe suspected of containing an abscess through an incision of the mastoid process rather than through burr holes above the ear. In his experience the abscess was more likely to be found by this technic.

FACIAL PARALYSIS

Glassburn [30] reported 3 cases of otitis media in which facial paralysis developed, on the sixth day in 1, on the fifteenth day in 1 and on the twenty-third day in 1. With sulfadiazine alone in 1 case and a combination of sulfadiazine and penicillin in 2 cases, the paralysis cleared up without operation. The duration of the paralysis before improvement was eleven, seven and twenty days. Return of function was complete. The conclusion is drawn that with penicillin conservative treatment is justified.

MENINGITIS

Cawthorne,[31] also speaking at the meeting of the Royal Society to discuss endocranial complications, described the different pathways by which organisms reach the meningeal spaces and discussed the treatment at length. He quoted Courville's article in detail and recommended its study. With penicillin his results have been excellent.

TECHNIC

McCurdy [32] reports the results of 122 mastoidectomies done in five years' time. He uses the endaural technic in both radical and simple

28. Hutchinson, C. A.: Otogenic Brain Abscess, J. Laryng. & Otol. **60**:43-55, 1945.

29. Davis, E. D. D., in Symposium on Endocranial Complications of Otitic Origin, J. Laryng. & Otol. **60**:129-143 (March) 1945.

30. Glassburn, E. M.: Facial Paralysis in Acute Otitis Media and the Use of Penicillin, Arch. Otolaryng. **41**:218-219 (March) 1945.

31. Cawthorne, T., in Symposium on Endocranial Complications of Otitic Origin, J. Laryng. & Otol. **60**:129-143 (March) 1945.

32. McCurdy, G. J.: Endaural Mastoidectomy: Five Years' Experience, Laryngoscope **55**:349-370 (July) 1945.

operations. There were no fatalities in his series. There were 53 radical, 23 modified and 46 simple mastoidectomies. The disadvantages of the endaural approach were listed as being less important than the advantages. The chief disadvantage in simple mastoidectomy was the slight difficulty of dealing with large cells of the petrous tip or extensions of retrosinus cells. The chief advantage was listed as the adequate continuous drainage obtained through the endaural window. Packing was not used. He agrees with the majority who have used the endaural approach that it is the method of choice in radical operations. [If the preliminary roentgenogram should show an unusually large pneumatic mastoid process or the presence of postsinus cells, most operators would choose the postauricular approach.]

Under the heading of technic should be mentioned again the method of Struble,[13] who has recently been dusting 100,000 units of penicillin powder into the mastoidectomy cavity just prior to closure with drainage.

Abstracts from Current Literature

Ear

A Method of Plastic Reconstruction of the Auricle: Preliminary Report. John F. Ford, Plastic & Reconstructive Surg. **1**:332 (Nov.) 1946.

Ford recognizes that construction of an ear for a patient with complete absence of the ear is a difficult operation. The need is to build an elastic framework and to cover this with material similar in appearance to that of the normal ear. A case of congenital absence of the auricle and a method of reconstruction are given in some detail; tissue from the normal ear was employed. The importance of correcting such a defect in a child is justly emphasized.

Seltzer, Philadelphia.

Errors in Diagnosis in Otitic Complications. Emhart L. Osvaldo, Rev. de otorrinolaring. **6**:53 (June) 1946.

The author presents 2 interesting cases of otitis with intracranial complications. These complications were erroneously diagnosed, even though the symptom complex was not complete in each case. However, the autopsy revealed the exact nature of the pathologic process present.

The first case presented was that of a patient with symptoms of septicemia and meningitis due to hemolytic streptococci, the original focus of which was undetermined. He was treated with penicillin and sulfonamide compounds, and after twenty days of the treatment the temperature became normal and all meningeal signs disappeared. However, at this time suppuration of the right ear was noted. This was of a chronic nature, and when a radical mastoidectomy was performed, the author found thrombosis of the lateral sinus. The sinus was opened and the thrombosis evacuated. However, the temperature again began to rise, and consequently the internal jugular vein was ligated, but the clinical picture did not improve. The possibility of a thrombus of the jugular bulb or that of an intracranial complication was then considered. Neurologic and ophthalmologic examinations gave negative results, and in consequence it was advisable to continue penicillin medication. Chills and fever still continued in spite of the fact that the retroauricular wound and the lateral sinus were completely healed. Another neurosurgical examination revealed slight motor disturbance, slight papilledema and slight paresis. In consequence of these findings the diagnosis of cerebellar abscess was made. As these symptoms continued to progress the brain was exposed and several punctures made, which yielded negative results; hence a diagnosis of walled-in basal meningitis was made. The patient died several days later, and the autopsy revealed miliary tuberculosis of the leptomeninges and pulmonary tuberculosis with an old subclavicular cavity in the right lung.

The second case was that of a 12 year old boy in whom mastoiditis developed, following scarlet fever. Mastoidectomy was performed, but the suppuration continued, and after forty-five days the mastoid wound was reviewed, but no necrotic foci were found. Two days later there was palsy of the external ocular motor nerve. In consequence the diagnosis of petrositis was made, and this was confirmed by the radiologist. Apicectomy according to the Lempert technic was performed, with negative results. Eight days later the child died, and the autopsy revealed tuberculous meningitis.

The occurrence of tuberculous meningitis either alone or in association with otitis is extremely difficult to diagnose. Its insidious onset, its bizarre symptoms due to the multiplicity of vital structures which can be involved either singly or in multiples, and the coincidence of other foci of infection as in this case, with disease of the middle ear or the mastoid, which alone often presents intracranial complica-

tions, all tend to increase the dilemma and confuse the issue. However, tuberculous meningitis does have certain characteristics. It is always secondary, usually to a primary focus in the lungs. This focus, on the other hand, may be minimal or may be difficult to demonstrate by physical examination, laboratory findings or the roentgenogram. Tuberculous meningitis is not an uncommon finding in infancy. Three symptoms are usually characteristic: 1. There is sensorial irritability. 2. There is sensorial paralysis plus motor irritability. 3. There is complete paralysis, both motor and sensorial. Once established certain findings are significant. The spinal fluid is characteristic in that it is clear and transparent but on standing shows formation of a typical pellicle; albumin and fibrin are increased, and the cells may reach 200 to 300 cells per cubic centimeter; lymphocytes predominate; the glucose and the chlorides are usually reduced. The hemogram may show a normal or a decreased white cell count. The sedimentation rate is increased. Pathologically, the infection originates in the choroid plexuses and from there spreads to the subarachnoid spaces, and terminates in the basal cisternas, thus producing typical basilar meningitis.

PERSKY, Philadelphia.

RECURRENT CEREBRAL ABSCESS OF OTITIC ORIGIN. J. S. RIESCO MAC-CLURE, Rev. de otorrinolaring. **6**:66 (June) 1946.

The author reports a case. A 19 year old patient had chronic suppurative otitis media of five years' duration. In the course of an acute exacerbation meningitis developed, at which time radical mastoidectomy was performed, with exposure of the dura and the lateral sinus. However, the postoperative course was extremely stormy, and eventually symptoms developed which pointed to an abscess of the right temporal lobe. The patient was operated on again; the temporal lobe was punctured, and 40 cc. of pure pus was evacuated. His progress was extremely favorable, and thirty-four days after the operation he was discharged from the hospital as cured and was permitted to return to work. However, while he was working severe headaches developed, with vomiting and loss of consciousness. On admission to the hospital he was found to have nuchal rigidity, Kernig's sign, nystagmus to the left and other signs indicating meningeal irritation. Sulfathiazole was administered, and most of his symptoms disappeared, but nevertheless it was decided to have a ventriculogram made. The diagnosis was inconclusive; another was made several days later, and at this time the author found a recurrence of the abscess in the right temporal lobe. However, five days later the patient died, and at autopsy an abscess was found in the temporal lobe.

The problems presented were: What caused the relapse? Did the patient return to work too soon? Did the author not permit sufficient time for complete drainage and for fibrosis of the abscess capsule, or would the recurrence have occurred in any event? These questions are rather difficult to answer. However, in evaluating the case the author reached the following conclusions: 1. The diagnosis of otitic cerebellar abscess is extremely difficult, particularly when there may be masking by other symptoms or complications. 2. When one suspects an intracranial abscess without positive signs of localization, the ventriculogram is extremely important. 3. Surgical treatment of cerebellar abscess depends on the presence of a firm capsule. 4. When an otitic abscess of the brain is correctly diagnosed and properly drained and the patient is apparently making an excellent recovery, one must be on guard for the possibility of a recurrence of the abscess as a result of incomplete encapsulation.

PERSKY, Philadelphia.

Pharynx

TONSILLECTOMY AND POLIOMYELITIS. DANIEL S. CUNNING, Ann. Otol., Rhin. & Laryng. **55**:583 (Sept.) 1946.

Cunning points out that the mode of transmission, the period of incubation, the portal of entry and the habitat of the causative virus of poliomyelitis are not known. He mentions the work of Sabin, who produced poliomyelitis in monkeys by injecting the virus into the tonsillopharyngeal region but was not able to pro-

duce the disease by painting the virus over this region in monkeys recently tonsillectomized. Toomey and Krill removed tonsils from 6 monkeys and then flooded the operative areas for five days with a 10 per cent virus suspension, without producing poliomyelitis. Agents which neutralize the virus of poliomyelitis have been found in nasopharyngeal washings of man. Recently it was reported that summer heat by affecting the body chemistry may increase susceptibility to the disease. Faber and Silverberg, studying 8 patients who died of poliomyelitis, reported histologic evidence which leads to the conclusion that the pharynx is a favorable site for the virus' penetration of the body. The neutralizing agents in the nasopharyngeal washings of man appear to diminish in certain inflammatory diseases of the upper respiratory tract. The work of many investigators indicates that the nasal secretions are the source of bacteriolytic enzymes, and probably this is true also for the virus agents. When local or general circumstances arise which lower the resistance of the tissues or decrease the amount of lysozymes, pathogenic bacteria can be implanted on the nasopharyngeal mucosa. This applies also to the viruses. Possibly, if tonsillectomy has any effect, it may be that of lowering the resistance of the body or retarding its functions, and not a direct local effect of the operative wound.

It should be remembered that both the positive and the negative evidence connecting poliomyelitis with tonsillectomy is experimental, and it is not known how closely one can translate the findings in monkeys and relate them to human infection. Recently Page surveyed the incidence of poliomyelitis following tonsillectomy at the Manhattan Eye, Ear and Throat Hospital during 1937, 1939 and 1941, when the incidence of the disease in New York was above normal expectations. Tonsillectomy had been performed on 27,849 patients. Cards sent to these brought 8,915 replies, and there was only 1 case of poliomyelitis reported among them. Cunning extended this survey from the months of July, August and September of 1942, through 1945. October and November 1945 were added, as then there was the most severe epidemic of recent years. Cards were sent to 5,470 in the 3 to 16 year age group. Replies from 2,289 showed 3 cases of poliomyelitis, mild in all, and of the bulbar type in none. Smith reported to the author that during the epidemic of 1944, 104 patients (3 to 16 years) who had poliomyelitis were admitted to the Grasslands Hospital, in 13 of whom the infection was of the bulbar type. None of these had undergone tonsillectomy within two months of the onset of the disease. In Connecticut in 1945 tonsillectomy was done on 10,000 persons, and 214 cases of poliomyelitis were reported, 12 of the bulbar type, and in none of the latter had tonsillectomy been recently performed. There were 3 patients with mild poliomyelitis who had been tonsillectomized just prior to the onset of the illness.

Cunning concludes that the widespread alarm of the public, shared by doctors in some communities, is unfounded on the basis of statistics.

M. V. MILLER, Philadelphia.

TONSILLECTOMY AND POLIOMYELITIS. EDWARD RUSSELL ROBERTS, Ann. Otol., Rhin. & Laryng. **55**:592 (Sept.) 1946.

It is estimated that tonsillectomy was performed on 70,000,000 persons during the last thirty-five years, and that 75 per cent of this number, or 52,500,000, were patients under 18 years of age, the ones most susceptible to poliomyelitis. It is estimated that in over half the instances the operation was done in the months that poliomyelitis is prevalent. During these thirty-five years there were 274 cases reported as having followed recent tonsillectomy. If all of these cases had appeared in the months poliomyelitis occurs, the incidence would have been 1 case of poliomyelitis in approximately 1,000,000 persons who had recently undergone tonsillectomy. When it is estimated that the average annual incidence of the disease in everyday life is 1 to 3,250 of population, these figures show that the annual incidence of poliomyelitis in everyday life is thirty-one times greater than that in the recently tonsillectomized population, even during the season for poliomyelitis.

M. V. MILLER, Philadelphia.

Nose

MODERN TREATMENT OF CHRONIC SINUSITIS. LELAND G. HUNNICUTT, J. A. M. A. **133**:84 (Jan. 11) 1947.

The author emphasizes the importance of complete cooperation of the internist and the pediatrician to give every possible aid to the rhinologist in the elimination of all systemic conditions that might contribute to or prolong sinusitis.

Decisions as to the type of treatment and the method of studying a given case are outlined, all of which are along the lines of tested procedures. Nonsurgical treatment and surgical treatment, the latter taking in some of the standard operations, are briefly discussed. The author feels that nonsurgical treatment includes so much more now than in past years that much less surgical treatment is necessary. The mucous membrane of the sinuses has greater recuperative powers than was once supposed; hence it is less frequently removed. All treatment, whether nonsurgical or surgical, should be carefully planned, so that many more cures of chronic sinusitis will result.

GORDON, Philadelphia.

RECONSTRUCTION OF BONY DEFECTS OF THE FACE WITH SPECIAL REFERENCE TO CANCELLOUS ILIAC BONE. D. W. MACOMBER, Surg., Gynec. & Obst. **83**:761 (Dec) 1946.

Macomber comments on the various materials used in reconstructive facial operations (tantalum, acrylic plastics, fascia lata, fat, deepithelized skin, cartilage, cancellous bone) and on the methods for their use. No foreign substance, he says, should be used. Fat is practically useless except for small subcutaneous pedicles to fill out small depressions. Fascia lata sometimes can be used for the same purpose. Homogeneous preserved cartilage may be particularly dependable, suitable, safe, and gives good results in the correction of facial defects.

SELTZER, Philadelphia.

SCLEROMA OF THE NOSE AND THE LARYNX. STEN HANSTEDT, Acta oto-laryng. **34**:339 (Aug.-Sept.) 1946.

Scleroma was first described by von Hebra and Kaposi in 1870. Certain encapsulated diplobacilli have been found in the nasal secretions and in the tissues, which are regarded by some as the causative agent. Up to 1936, 2,631 cases had been registered. Galicia, Wolhynian near the Pripet marshes, Sumatra and Guatemala have definite endemic foci. With the increased ease of transportation of the past ten years, numerous cases have been reported from South America, the United States and Canada. The disease affects women slightly more than men and involves those in the general age group of 16 to 35 years.

Pathologically, scleroma is a chronic process occurring in the mucosa and submucosa of the nose, the nasopharynx and the larynx. It pursues a course characterized by four stages:

1. Atrophic stage. The clinical picture is that of atrophic rhinitis.
2. An indifferent granulation stage in which round cells and plasma cells occur.
3. The third stage in which Mikulicz cells and Russell bodies appear, and the infiltration becomes as hard as cartilage.
4. The end stage with connective tissue formation and atrophy, in which the Mikulicz cells and Russell bodies disappear.

The progress is slow. The presence of Mikulicz cells and Russell bodies is not specific for scleroma, as they are also found in other pathologic conditions. The etiology is in question, but it is not unlikely that the condition is caused by the encapsulated diplobacilli described by Frisch. However, efforts to reproduce the disease by injections of these bacteria have failed.

In its early stages scleroma cannot be differentiated from atrophic rhinitis. When it occurs in the larynx, it is always bilateral and subglottic in localization.

Initially the tumor mass is soft and of a reddish color and shows no tendency to ulcerate. Later it becomes as hard as cartilage. When the localization is in the larynx, tracheotomy often becomes necessary because of dyspnea.

The diagnosis is easily made in typical cases, but in the atypical ones the growth must be differentiated from perichondritis, syphilis, tuberculosis and other tumors. It is probably not infectious.

The best treatment, in Hanstedt's opinion, is surgical removal followed by irradiation. The prognosis is not good.

Hanstedt reports a case. The patient was a 56 year old woman who, as far as could be determined, had had no contact with any other patient with the condition. The localization of her scleroma was subglottic. She died from intercurrent pneumonia.

GROVE, Milwaukee.

Miscellaneous

SOME OF THE COMMON ERRORS IN RHINOPLASTIC SURGERY AND HOW TO AVOID THEM. H. H. BEINFIELD, Eye, Ear, Nose & Throat Monthly **25**:491 (Oct.) 1946.

This is a detailed critical consideration of fourteen points in which mistaken rhinoplastic procedure may give unsatisfactory results, with suggestions by which such results may be avoided. The warnings include: (1) careful facial analysis, (2) the use of complete anesthesia, (3) careful surgical asepsis, (4) correction of septal deviation, if present, prior to rhinoplasty, (5) care to prevent dropping of the nasal tip, (6) avoidance of bleeding into the field, (7) care not to overcorrect in shortening the dorsum, (8) smoothing dorsal irregularities that have resulted from the operation, (9) avoidance of operating at too high a plane in narrowing the nose, (10) careful, nontraumatic technic to escape discoloration of skin about the eyes and over the face, (11) assuring a suitable not too wide nasal angle, (12) final correction of alae and tip to give an esthetic result, and (13-14) proper post-operative care.

SELTZER, Philadelphia.

DIFFERENTIAL DIAGNOSIS OF APHASIA IN CHILDREN. LORNA S. NANCE, J. Speech Disorders **11**:219, 1946.

The problem of children of potentially normal intelligence who manifest aphasia in childhood has been recognized for approximately one hundred years. In children aphasia is a disorder of the development of language, but the cause has not been conclusively established. The conditions which most frequently explain failures of language to develop are mental retardation, hearing disability, lack of stimulation, lack of motivation and emotional trauma. The first two can be measured objectively. The last three may be ascertained on the basis of historical evidence. If all of these factors were ruled out in a given case, this case would be called one of aphasia. Two types of aphasia exist in children: expressive aphasia and receptive-expressive aphasia. A complete case history is taken in all such cases. The Vineland Social Maturity Scale is given. Hearing is tested by training the child to discriminate between two sounds, a separate light being used simultaneously with each sound to produce a cue. The light cue is then eliminated, and the child is expected to respond to the sound alone. For each correct response he receives a small reward. No standard intelligence tests can be used on young children to distinguish between aphasia and feeblemindedness. The author developed a test constructed in terms of age levels similar to the Stanford-Binet test, since it was expected that the aphasic child would be low in use of language at times as compared with the mentally defective child, who would be consistently low. On the basis of this test, children can be divided into three groups: (1) those in whom there is no comprehension and no use of language, (2) those who show substantially

normal comprehension but no use of language, and (3) those who show both comprehension and use of language, but whose speech is not intelligible. The finding of congenital aphasia depends on a negative finding relative to mental retardation, hearing disability, emotional problems, lack of stimulation, lack of motivation, social immaturity, birth injury and severe articulatory defects.

PALMER, Wichita, Kan.

SPEECH DISORDERS IN WORLD WAR II: V. ORGANIZATION OF A SPEECH CLINIC IN AN ARMY GENERAL HOSPITAL. WILLIAM G. PEACHER, J. Speech Disorders **11**:233, 1946.

Efficient service of the special units of an army general hospital will depend on the following factors: (1) an interested neurologist or neurosurgeon; (2) a well trained supporting medical staff; (3) a speech pathologist, a psychologist, an occupational therapeutist and a physical therapeutist, all properly qualified; (4) a satisfactory, workable, yet simple, classification to include dysphasia, dysarthria, dysphemia, dysphonia and dyslalia; (5) methods of examination sufficiently graded and standardized for all individual needs, to allow for a wide variety of performance and for a comparison of results and to aid in determining prognosis; (6) adequate equipment and laboratory facilities; (7) detailed and frequent records; (8) one ward centralization of all patients with strategic location of all associated therapeutic services; (9) specific speech therapy coordinated with a well functioning daily reconditioning program.

PALMER, Wichita, Kan.

AIDS IN THORACIC SURGERY. CHARLES L. BURSTEIN and E. A. ROVENSTINE, New York State J. Med. **46**:2142 (Oct. 1) 1946.

This paper was read before the section on anesthesiology at the annual meeting of the Medical Society of the State of New York, May 2, 1946. The results are based on work carried out in the New York University College of Medicine.

The authors issue the following summary after analyzing observations in over 2,000 cases in which anesthesia was induced for thoracotomy: The use of the elevated chest is condemned. This practice may be responsible for severe cardiocirculatory depression, which may be relieved by removing the chest block. Three measures are helpful: 1. Compensated respiration. The technic and advantages of this type of respiratory control are well described. 2. Intravenous injection of procaine hydrochloride to combat arrhythmia. 3. Vagal nerve block at the base of the skull. This is suggested and described to overcome vagal reflexes when the vagus nerve in the chest and the vagal plexus are inaccessible for local block infiltration. One case history is adduced for the purpose of illustration.

VOORHEES, New York.

RECONSTRUCTION FOR PARTIAL LOSS OF EAR. J. W. MALINIAC, Plastic & Reconstr. Surg. **1**:124 (Sept.) 1946.

Maliniac considers the difficulties of satisfactorily repairing total or partial loss of the ear. It emphasizes the need of individual methods to suit the cases, rather than a general technical process. Two well illustrated operations for accidental injuries of the ear, with considerable loss of tissue, are presented.

SELTZER, Philadelphia.

FURTHER REPORTS ON THE USE OF COMPOSITE FREE GRAFTS OF SKIN AND CARTILAGE FROM THE EAR. J. B. BROWN, B. CANNON, C. E. LISCHER, W. B. DAVIS, A. MOORE and J. MURRAY, Plastic & Reconstr. Surg. **1**:130 (Sept.) 1946.

The authors give the results of their use of a method of repairing losses of tissue about the nasal tip, including the alae and the columella, which requires only a

single operation. The technic has been used in 50 cases, with only four failures. A free transplant is taken from the auricle, which supplies two layers of skin with the intervening cartilage. The length of the graft is not significant, but a width of more than 1 cm. is less successful. A careful pattern of the required graft is desirable in choosing the donor area. The most useful material has been taken from the outer margin of the helix. Tissue from the crus may be used for small areas. Repair of the donor area of the helix is made from the adjacent skin of the scalp, and repair of the crus by direct closure. The article is well illustrated with photographs.

SELTZER, Philadelphia.

FREE EAR LOBE GRAFTS OF SKIN AND FAT. S. M. DUPERTUIS, Plastic & Reconstr. Surg. **1**:135 (Sept.) 1946.

This author describes his successful repairing of loss of substance of the nasal tip by using a wedge of full thickness taken from the lobe of an ear. Of 15 such operations, 11 were successful. The size and the shape of the material required are approximated on the lobe where the border is straight. The wedge is removed under local anesthesia, and the aural wound is sutured at once. The graft is then shaped to fit the contour of the defect and sutured in position with 6-0 silk, so placed that subcutaneous fat is included, and exact approximation of all edges is secured. If the nasal defect is large, grafts from both ears may be required and should be taken at separated operative stages, to allow one graft to establish a vascular supply before including the second one. Dressings that give gentle pressure and firm immobilization are important. Excellent drawings and photographs, some of which are in color, demonstrate the operative procedure and its results.

SELTZER, Philadelphia.

THE PUSH-BACK OPERATION FOR REPAIR OF CLEFT PALATE. G. M. DORRANCE and J. W. BRANSFIELD, Plastic & Reconstr. Surg. **1**:145 (Sept.) 1946.

Dorrance and Bransfield present an evaluation of twenty years of experience with the push back operation for congenital insufficiency of the palate, a procedure used when velvopharyngeal closure is impossible. The repair of a palatal cleft alone is of necessity inadequate to correct the deformity, which results from a deficiency of the horizontal plate of the palate bone. The first step is to determine the degree of the deficiency. This being decided, the push back operation is done in two stages in all cases. Two questions are particularly dealt with in this paper: (1) whether the posterior palatine arteries should be divided; (2) whether the under surface of the flap should be lined with a skin graft. In the first instance, the palatine vessels are divided if the flap is relatively normal and well developed, with an adequate vascular supply, since sufficient lengthening cannot be secured otherwise. Pulling out the vessels, which has been suggested, has not been found satisfactory. When the original blood supply is too limited, a median bridge is left to insure sufficient circulation of blood. Since the flap thickens considerably after being elevated and returned to its original bed, the process may be repeated if added thickening of the tissues is desired. The answer to the second question is that a skin graft gives better results, since its omission ends in contraction and thickening of the raw surface. This condition prevents the formation of a soft and elastic palate, the chief end desired for the operation, which is essentially intended to permit production of normal speech. Details of the successive steps of the push back operation are given for the varied palatal defects in which its use is indicated. Excellent illustrations are included, showing fully the anatomy of the parts concerned, the deformities which result from maldevelopment, and the methods of reconstruction and repair. A study of the article itself is the only adequate course for the operator who wishes to follow the procedure.

SELTZER, Philadelphia.

MOTION PICTURES AS A TEACHING AID IN PLASTIC SURGERY. G. V. WEBSTER and R. B. LEWIS, Plastic & Reconstr. Surg. **1**:229 (Sept.) 1946.

These authors present interesting arguments in favor of their thesis that motion pictures should be more generally used in the teaching of plastic surgery. They emphasize that a given condition and its corrective technic can be more clearly demonstrated by repeated projections of a film than by the original operation and that such repetitions are of value in giving definite visual instruction. Details of the operative field can be magnified and in this way be made clearer to the student. Postoperative results can be compared directly with the preoperative condition by means of films. An accumulation of case records can be drawn on by the instructor at any time, as desired, for illustration of a subject. Film planning and preparation are considered, and a bibliography is appended, which includes a list of films already completed by one of the authors (G. V. W.).

SELTZER, Philadelphia.

THE IMPORTANCE OF THE PREMAXILLA AND THE PHILTRUM IN BILATERAL CLEFT LIP. H. S. VAUGHAN, Plastic & Reconstr. Surg. **1**:240 (Sept.) 1946.

Vaughan considers the pitfalls in repairing bilateral cleft lip. His general comment is that all available tissue must be saved and secured in its normal relations. More specifically, emphasis is laid on the desirability of using the philtrum to gain perpendicular length of the central portion of the upper lip, with a vermilion border being taken from the alar margins of the clefts. It has been particularly observed that there will be a considerable development of the philtrum when it is placed in this position at the time of the primary operation. The reposition of the premaxilla is particularly important and should be made surgically before the lip is operated on. Details of both operations are given and are illustrated by photographs and drawings. A useful bibliography is appended.

SELTZER, Philadelphia.

Directory of Otolaryngologic Societies *

INTERNATIONAL

First Pan-American Congress of Oto-Rhino-Laryngology and Bronchoesophagology

President: Dr. Gordon B. New, Mayo Clinic, Rochester, Minn.
Secretary: Dr. Chevalier L. Jackson, 255 S. 17th St., Philadelphia 3.

NATIONAL

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Dr. J. Mackenzie Brown, 1136 W. 6th St., Los Angeles.
Secretary: Dr. Fletcher D. Woodward, 104 E. Market St., Charlottesville, Va.
Place: Atlantic City. Time: June 9-13, 1947.

American Academy of Ophthalmology and Otolaryngology

President: Dr. Alan C. Woods, Johns Hopkins Hospital, Baltimore 5.
President-Elect: Dr. C. H. McCaskey, 20 N. Meridian St., Indianapolis, Ind.
Executive Secretary-Treasurer: Dr. William L. Benedict, 100–1st Ave. Bldg., Rochester, Minn.
Place: Palmer House, Chicago. Time: Oct. 12-17, 1947.

American Broncho-Esophagological Association

President: Dr. Robert M. Lukens, Medical Arts Bldg., Philadelphia 2.
Secretary: Dr. Paul Holinger, 700 N. Michigan Ave., Chicago 11.
Place: Hotel Brighton, Atlantic City. Time: June 9, 1947.

American Laryngological Association

President: Dr. Frank R. Spencer, Physicians Bldg., Boulder, Colo.
Secretary: Dr. Arthur W. Proetz, Beaumont Bldg., St. Louis.

American Laryngological, Rhinological and Otological Society, Inc.

President: Dr. Harry W. Lyman, 906 Carleton Bldg., St. Louis.
Secretary: Dr. C. Stewart Nash, 708 Medical Arts Bldg., Rochester 7, N. Y.

SECTIONS:

Eastern.—Chairman: Dr. Robert F. Ridpath, 18th and Chestnut Sts., Philadelphia.
Southern.—Chairman: Dr. Walter T. Hotchkiss, 541 Lincoln Rd., Miami Beach, Fla.
Middle.—Chairman: Dr. Oliver E. Van Alyea, 135 S. La Salle St., Chicago.
Western.—Chairman: Dr. Colby Hall, 1136 W. 6th St., Los Angeles, Calif.

American Otological Society

President: Dr. William E. Grove, 324 E. Wisconsin Ave., Milwaukee, Wis.
Secretary: Dr. Gordon D. Hoople, 713 E. Genesee St., Syracuse, N. Y.

American Otorhinologic Society for the Advancement of Plastic and Reconstructive Surgery, Inc.

President: Dr. Alfred Schattner, 115 E. 61st St., New York.
Secretary: Dr. Norman N. Smith, 291 Whitney Ave., New Haven, Conn.

* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.